STB FD-32760 ID-181986 9-15-97 K 5/9

Central Avenue		Wednesday	3/12/97	10:30 AM
Engine	Direction	Type	# cars	speed
BN 7895	NB	Grain	78	28.2 mph
Beginning	End	End Warning		
0:22	2:14	2:21		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	2192 secs	29	18	1 min 15 secs
Westbound	1550 secs	24	15	1 min 4 secs

Central Avenue		Wednesday	3/12/97	6:50 AM
Engine	Direction	Type	# cars	speed
UP 2742	SB	Local	43	0 mph
Beginning	End	End Warning		
0:30	3:26	3:38		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	2362 secs	17	17	2 min 18 secs
Westbound	1114 secs	8	8	2 min 19 secs

Central Avenue		Wednesday	3/12/97	8:48 AM
Engine	Direction	Type	# cars	speed
UP 3329	NB	Manifest	80	8.9 mph
Beginning	End	End Warning		
0:31	6:45	7:06		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	13861 secs	55	55	4 min 11 secs
Westbound	21545 secs	101	81	3 min 32 secs

Central Avenue		Wednesday	3/12/97	8:48 AM
Engine	Direction	Type	# cars	speed
SF 3680	SB	Local	20	9.9 mph
Beginning	End	End Warning		
0:34	2:04	2:15		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	308 secs	5	4	1 min 1 secs
Westbound	458 secs	5	5	1 min 31 secs

Central Avenue		Wednesday	3/12/97	9:11 AM
Engine	Direction	Type	# cars	speed
CK 2233	NB	Local	54	10.2 mph
Beginning	End	End Warning		
1:11	4:43	4:58		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
20	4538 secs	24	22	3 min 9 secs
Eastbound	7306 secs	48	42	2 min 31 secs

37th Street	Monday	3/10/97	12:37 PM	
Engine	Direction	Type	# cars	speed
UP 1095	NB	Unknown	0	0 mph
Beginning	End	End Warning		
0:47	1:08	1:19		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	0 secs	0	0	0 min 0 secs
Westbound	0 secs	3	0	0 min 0 secs

Pawnee Road	Thursday	3/13/97	6:11 PM	
Engine	Direction	Type	# cars	speed
UP 3829	SB	Manifest	71	18.1 mph
Beginning	End	End Warning		
0:37	3:00	3:08		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	7886 secs	51	51	2 min 34 secs
Westbound	8758 secs	78	58	1 min 52 secs

Pawnee Road	Monday	3/10/97	7:03 PM	
Engine	Direction	Type	# cars	speed
CNW 5502	NB	Empty Grain	103	13.2 mph
Beginning	End	End Warning		
0:36	5:55	6:02		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	25372 secs	87	87	4 min 51 secs
Westbound	16554 secs	76	65	3 min 37 secs

Pawnee Road	Thursday	3/13/97	2:24 PM	
Engine	Direction	Type	# cars	speed
UP 222	NB	Light	2	0 mph
Beginning	End	End Warning		
0:36	0:44	0:48		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	554 secs	16	10	0 min 34 secs
Westbound	328 secs	9	8	0 min 36 secs

Pawnee Road	Thursday	3/13/97	11:14 AM	
Engine	Direction	Type	# cars	speed
UP 2210	SB	Local	10	17.1 mph
Beginning	End	End Warning		
0:24	0:43	0:49		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	306 secs	8	6	0 min 37 secs
Westbound	460 secs	17	9	0 min 26 secs

13th Street	Tuesday	3/11/97	10:20 AM	
Engine	Direction	Type	# cars	speed
UP 2210	NB	Local	19	13.5 mph
Beginning	End	End Warning		
0:40	1:38	1:44		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	985 secs	17	13	0 min 57 secs
Westbound	516 secs	6	6	1 min 25 secs

13th Street	Tuesday	3/11/97	6:35 AM	
Engine	Direction	Type	# cars	speed
UP 2742	SB	Local	18	0 mph
Beginning	End	End Warning		
0:31	1:16	1:22		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	519 secs	9	8	0 min 57 secs
Westbound	424 secs	8	6	0 min 52 secs

13th Street	Tuesday	3/11/97	9:57 AM	
Engine	Direction	Type	# cars	speed
UP 2237	NB	Local	59	17 mph
Beginning	End	End Warning		
0:40	2:46	2:52		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	1784 secs	25	20	1 min 10 secs
Westbound	2597 secs	20	20	2 min 9 secs

13th Street	Tuesday	3/11/97	7:20 PM	
Engine	Direction	Type	# cars	speed
SP 8017	SB	Manifest	94	11.6 mph
Beginning	End	End Warning		
0:54	6:27	6:36		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	8636 secs	45	39	3 min 11 secs
Westbound	12416 secs	55	49	3 min 45 secs

MacArthur Avenue		Friday	3/14/97	3:07 PM
Engine	Direction	Type	# cars	speed
UP 259	NB	Manifest	94	17.6 mph
Beginning	End	End Warning		
0:48	4:10	4:11		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	7053 secs	48	43	2 min 26 secs
Westbound	9912 secs	72	70	2 min 17 secs

MacArthur Avenue		Friday	3/14/97	4:34 PM
Engine	Direction	Type	# cars	speed
UP 9402	NB	Empty Grain	78	19.8 mph
Beginning	End	End Warning		
0:36	3:15	3:17		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	2658 secs	41	20	1 min 4 secs
Westbound	2668 secs	21	20	2 min 6 secs

MacArthur Avenue		Friday	3/14/97	6:29 PM
Engine	Direction	Type	# cars	speed
UP 9020	SB	Grain	100	18.7 mph
Beginning	End	End Warning		
0:40	4:24	4:25		
Direction	Total Delay	Total Vehs.	Max Queue	Av. Veh. Delay
Eastbound	8366 secs	63	48	2 min 12 secs
Westbound	3270 secs	25	21	2 min 10 secs

Average Vehicle Spacing Data

The following table summarizes the vehicle spacing and data gathered in Wichita. This data was used for model calibration and to calculate maximum queue lengths.

Crossing	Queue Length	Number of Vehicles	Number of Lanes	Spacing (ft./veh.)
13th Street	90	4	1	22.5
13th Street	130	9	2	28.9
13th Street	218	17	2	25.6
13th Street	315	17	2	31.5
MacArthur	235	10	1	23.5
MacArthur	23	10	1	23.0
Central	250	10	1	25.0
Central	260	10	1	26.0
Central	265	10	1	26.5
Central	240	10	1	24.0
Mean	-	-	-	25.6
Weighted Av.	2689	107	1	25.1

Appendix G Pedestrian Safety

Appendix G
PEDESTRIAN SAFETY

Wichita residents expressed concern that the addition of trains could potentially affect pedestrian safety, especially where school children are involved. Currently, UP tracks bisect the boundaries of 11 Wichita elementary schools. The SEA study team sent a list of questions to Wichita Unified School District 259 requesting detailed student route information (i.e., where students walk to school and where they are most likely to encounter railroad crossings). The school district returned the questionnaire, along with the school board's Provision of Transportation Services Because of Hazardous Traveling Conditions. The policy determines the location of hazardous traveling conditions and authorizes transportation services for students who must travel these routes. The SEA study team compiled the number of students in Wichita elementary schools required to cross the UP Wichita-Chickasha rail line and categorized this information by school, number of students, total crossings, and the roadway crossings utilized. These data can be found on the following pages.

Appendix G

SEA Study Team Questions to Unified School District 259 and Answers

1. How many students walk to each of the following schools?

• North High	803
• Hamilton Middle	422
• Marshall Middle	409
• Franklin Elementary	178
• Gardiner	217
• Horace Mann	366
• Ingalls	225
• Irving	330
• L'Ouverture	85
• Lincoln	188
• Park	144
• Riverside	158
• Washington	216
• Woodland	193

2. For each of these elementary schools, do you have a site plan showing the school's location and entrance locations? *Yes, we have plans attached.*

3. How many residential units are served by each school? *We do not have that information.*

4. What is the school district's average number of pupils per residential unit? *We do not have that information.*

5. For the following questions, please list the requested information tabularly. *Results are shown in Table 1 below.*

   Of the total students who walk to each school:

   a. How many students at each school specifically cross the UP OKT Sub Branch?

   b. How many students at each school specifically cross the UP Hutchinson Branch?

   c. How many students at each school specifically cross the BNSF-East Branch?

   d. How many students at each school specifically cross the BNSF-West Branch?

6. Does the school district have official walking routes that students are instructed to follow? *No.* Do these students follow them? *No.*

7. What are the official routes across the UP Railroad's OKT Sub Branch? *There are none*.

8. Based on your knowledge of the walking patterns of students at each school, what would you say are the "unofficial" walking routes for students who walk to each school who must cross the UP OKT Branch? Can you trace that on a map of the area for us? *This is a parental decision.*

9. What is the school district's specific policies and criteria for Level 1 and Level 2 Hazards that are used in determining the number of students requiring school bus transportation services? *Copies of these policies are attached.*

Table 1: Number of Students Who Walk—by Location, by School

School	Students required to cross UP OKT Sub	Students required to cross UP Hutchinson	Students required to cross BNSF- East Branch	Students required to cross BNSF-West Branch	Students not required to cross any railroad	Total Students who walk to/from school*
North High	35	108	35	35	590	803
Hamilton MS	37	0	3	0	382	422
Marshall MS	6	84	6	6	307	409
Franklin Elem.	0	30	0	0	148	178
Gardiner	75	0	10	0	132	217
Horace Mann	24	228	24	18	72	366
Ingalls	3	0	3	3	216	225
Irving	10	107	10	10	193	330
L'Ouverture	7	5	7	7	59	85
Lincoln	0	0	0	0	188	188
Park	16	59	16	15	38	144
Riverside	4	7	0	0	147	158
Washington	10	0	4	4	198	216
Woodland	0	0	0	0	193	193

* May be less than total of the first four columns if some students cross more than one rail line

P7330 PROVISION OF TRANSPORTATION SERVICES BECAUSE OF HAZARDOUS TRAVELING CONDITIONS

BOARD POLICY:

Pupil transportation services will be provided elementary and middle school pupils who reside less than two and one-half (2 1/2) miles from their assigned attendance center when the administration determines that hazardous traveling conditions exist and the Board of Education authorizes such services. Such Board action shall specify the hazardous conditions which justify transportation services provided by the district. The extent of transportation services to be provided shall be determined by the Board on the basis of available funds. Notwithstanding the foregoing and upon authorization of the Board of Education, high school pupils residing less than two and one-half miles from their assigned attendance center, and under otherwise hazardous traveling conditions, will be permitted to utilize seating on existing bus routes to the extent available. Priority in the allocation of such existing seats will be give first to ninth and tenth grade pupils.

Administrative Implemental Procedures:

1. The administration will make recommendations regarding the existence of hazardous traveling conditions.

2. Hazardous traveling areas are defined as those areas where pupils in walking to and from school are:

   a. Required to walk on roadways where the posted speed is 35 miles per hour or more, other than crossing at signal lights and intersections. This would include areas where there are no surfaces on which to walk safely other than the roadway, i.e., no easement, paths, or sidewalks are accessible.

   b. Required to cross four or more consecutive lanes where the posted speed is 35 miles per hour or more, lack of pedestrian controlled or automatically controlled crosswalks, and heavy traffic flow—32,000 vehicles or more on an average daily count taken by the Traffic Engineering Department of the City of Wichita.

   c. Required to cross two or more adjacent railroad tracks where the posted speed is 35 miles per hour or more, lack of pedestrian controlled or automatically controlled crosswalks, and moderate or heavy traffic flow—23,000 vehicles or more on an average daily count taken by the Traffic Engineering Department of the City of Wichita.

   d. Required to cross bridges where there is no pedestrian walkway.

3. If the hazard is on the most direct route and an alternate route without hazard is available, hazardous transportation will not be provided.

4. Recommendations to provide transportation services for pupils who reside less than two and one-half miles from their assigned attendance area shall be made on the basis of the hazards involved.

(over)

5. When the administration determines the specific hazard identified by the Board to justify providing transportation services has been rectified, Transportation Services shall notify the appropriate building administrator. The building administrator shall have ten working days in which to notify the lawful custodians of the pupils involved. Elimination of transportation service shall occur 45 days after notification to the lawful custodians. If the administration believes a new hazardous condition has developed in the interim, the issue shall be placed on a Board agenda for determination.

Administrative Responsibility: Transportation Services
Latest Revision Date: November 1992
Previous Revision Date: September 1988

Appendix H Train-Vehicle Accident Risk Calculations

Appendix H
TRAIN-VEHICLE ACCIDENT RISK CALCULATIONS

The SEA study team calculated the risk of accidents at grade crossings using a standard method developed by the Federal Railroad Administration (FRA). The method, described in *Summary of the DOT Rail-Highway Crossing Resource Allocation Procedure—Revised*, calculates the risk of an accident at a grade crossing based upon the characteristics of the grade crossing and statistical information on accident experience at grade crossings. The method uses three formulas.

First, the SEA study team calculated an initial predicted number of accidents per year at each crossing (a) using the following formula. The FRA maintains databases that are an inventory of grade crossing characteristics and a record of accidents and incidents at grade crossings. The first formula below is the result of a detailed analysis of the traffic accident and grade crossing information from the FRA databases.

$$a = K \times EI \times DT \times MS \times MT \times HP \times HL$$

Where:

	a =	accident—initial predicted number of accidents per year
	K =	constant—basic accident prediction formula constant
	EI =	exposure index—factor based on the product of the number of highway vehicles and trains per day
	DT =	daylight trains—factor for the number of through trains per day during daylight
	MS =	maximum speed—factor for maximum timetable speed
	MT =	main tracks—factor for number of main tracks
	HP =	highway pavement—factor for paved highway
	HL =	highway lanes—factor for number of highway lanes

Second, the team used the following formula to account for actual accident history at the crossing and calculate the weighted average of the predicted accident rate (B). Because the FRA data cannot describe the precise characteristics of each crossing, such as sight distances, the calculation of predicted accident rates is improved by adding actual accident experience at a grade crossing. The results of the first formula are an input to the second formula below, which averages the initial predicted accident rates for a grade crossing with the actual experience. The FRA recommends that actual accident experience be limited to the past five years, as characteristic of the grade crossing may have changed such that earlier experience is not representative of future expected rates.

$$B = \frac{T_o}{T_o + T}(a) + \frac{T}{T_o + T}(N/T) \text{ where } T_o = 1/(0.05 + a)$$

Where: $B =$ weighted average of predicted accident rate and actual accident history
$T =$ number of years of recorded accident history
$T_o =$ weighting factor in DOT accident prediction formula
$N =$ number of accidents recorded for a crossing in T years

Third, the team considered the type of grade crossing warning device, which affects the accident rate, and calculated the total predicted accident rate using the following formulas. The result of the second formula is an input to the third formula, which applies a constant that adjusts for the type of warning device at the crossing.

$A = 0.8239 \times B$ for passive devices
$= 0.6935 \times B$ for flashing lights
$= 0.6714 \times B$ for gates

The values shown in the third formula are updated from the ones included in the original report, and are drawn from a more-recent report, *Highway-Rail Crossing Accident/Incident and Inventory Bulletin No 18, Calendar Year 1995*. They were developed in 1992 and are the values currently in use.

For the Wichita Mitigation Study, FRA provided the study team with the information from their databases on grade crossing characteristics and accident data for Kansas. Study team members met with FRA staff several times to review the information and clarify its application to the study.

Attachment H-1 is an example of the information for grade crossing characteristics shown for one crossing. The study team reviewed the grade crossing information to verify its accuracy and, where necessary, made corrections based upon observations in the field.

Attachment H-2 is an example of the accident records for one accident. As the FRA recommends, the study team used accident data only from the most recent five years.

Information on the numbers of trains and the time of day that they run was drawn from the study team's analysis of train operations, described in Appendix D. UP provided information on the maximum timetable speeds in effect for both pre-merger and post-merger conditions.

Highway traffic volumes were the same ones calculated by the study team for use in the analysis of all impacts. Their derivation is described in Appendix E.

The formulas, FRA information, and other information on the characteristics of grade crossings in Wichita and Sedgwick County allowed the study team to calculate the predicted accident risk for different conditions and to compare them. The study team used this same method to assess accident risk for both pre- and post-merger conditions and to calculate the effectiveness of each mitigation measure that would affect train-vehicle accidents. Attachment H-3 is an example of the calculations.

Attachment B-1
U.S. DOT-AAR CROSSING INVENTORY INFORMATION
AS OF 01/24/97
FOR THE STATE OF KANSAS

CROSSING NUMBER: 445105U   EFFECTIVE BEGIN-DATE OF RECORD: 10/01/92

PART I LOCATION AND CLASSIFICATION OF ALL CROSSINGS

RAILROAD: Union Pacific Railroad Company   DIVISION: KANSAS   SUBDIVISION: HUTCHINSO
STATE: KANSAS   COUNTY: SEDGWICK   COUNTY MAP REF. NO.: 71
NEAREST CITY: WICHITA   HWY TYPE AND NO.:
STREET OR ROAD NAME: MURDOCK ST   RAILROAD I.D. NO.: S4970L0000   FRA RR NETWORK LIC: MP281
NEAREST RR TIMETABLE STN.:   BRANCH OR LINE NAME: RAILROAD MILEPOST: 0484.73
CROSSING TYPE AND PROTECTION: PUBLIC   AT GRADE

PART II DETAILED INFORMATION FOR PUBLIC VEHICULAR AT GRADE CROSSINGS

TYPICAL NUMBER OF DAILY TRAIN MOVEMENTS: 4 DAY THRU 6 DAY SWITCHING 0 NIGHT THRU 4 NIGHT SWITCHING
SPEED OF TRAIN AT CROSSING: MAXIMUM TIMETABLE SPEED 20 TYPICAL SPEED RANGE OVER CROSSING FROM 00 TO 20 MPH
TYPE AND NUMBER OF TRACKS: 1 MAIN 0 OTHER
DOES ANOTHER RR OPERATE A SEPARATE TRACK AT CROSSING? NO
DOES ANOTHER RR OPERATE OVER YOUR TRACK AT CROSSING? NO
TYPE OF WARNING DEVICE(S) AT CROSSING
SIGNS: 0 REFLECTORIZED CROSSBUCK(S)   0 NON-REFLECTORIZED CROSSBUCK(S)
0 STANDARD HIGHWAY STOP SIGN(S)   0 OTHER STOP SIGN(S)
0 OTHER SIGN(S):   0 OTHER SIGNS:
TRAIN ACTIVATED DEVICES: 0 RED AND WHITE REFLECTORIZED GATES   0 OTHER COLORED GATES
2 CANTILEVERED FLASHING LIGHTS OVER TRAFFIC LANES   0 CANTILEVERED FLASHING LIGHTS NOT OVER TRAFFIC LANE
0 MAST MOUNTED FLASHING LIGHTS   0 OTHER FLASHING LIGHTS:
0 HIGHWAY TRAFFIC SIGNALS   0 WIGWAGS 1 BELLS
SPECIAL WARNING DEVICES NOT TRAIN ACTIVATED: NONE
IS COMMERCIAL POWER AVAILABLE? YES
DOES CROSSING SIGNAL PROVIDE SPEED SELECTION FOR TRAINS? NO
METHOD OF SIGNALLING FOR TRAIN OPERATION: IS TRACK EQUIPPED WITH SIGNALS? NO

PART III PHYSICAL DATA

TYPE OF DEVELOPMENT: COMMERCIAL
SMALLEST CROSSING ANGLE: 60 TO 90 DEGREES
NUMBER OF TRAFFIC LANES CROSSING RAILROAD: 2
ARE TRUCK PULLOUT LANES PRESENT? NO
IS HIGHWAY PAVED? YES
PAVEMENT MARKINGS: STOPLINES AND RR CROSSING SYMBOLS
ARE RR ADVANCE WARNING SIGNS PRESENT? YES
CROSSING SURFACE: SECTIONED TIMBER
DOES TRACK RUN DOWN A STREET? NO
NEARBY INTERSECTING HIGHWAY? YES

PART IV HIGHWAY DEPARTMENT INFORMATION

HIGHWAY SYSTEM: NON-FEDERAL-AID
IS CROSSING ON STATE HIGHWAY SYSTEM? NO
FUNCTIONAL CLASSIFICATION OF ROAD OVER CROSSING: URBAN:LOCAL
ESTIMATED AADT: 008788
ESTIMATED PERCENT TRUCKS: 05

Attachment B-2
RAIL-HIGHWAY GRADE CROSSING
ACCIDENT/INCIDENT REPORT

GRADE CROSSING ID: 445105U   DATE OF INCIDENT: 04/05/92   TIME: 1130 AM

RAILROADS INVOLVED	INCIDENT NUMBER	ALPHABETIC CODE	
REPORTING RAILROAD:	0492T0003	UP	Union Pacific Railroad Company
OTHER RAILROAD INVOLVED:	---	---	
RAILROAD RESPONSIBLE FOR TRACK MAINTENANCE:	0492T0003	UP	

PART 1: LOCATION

NEAREST RAILROAD STATION: WICHITA   COUNTY: SEDGWICK   STATE: KANSAS
CITY: WICHITA   HIGHWAY: MURDOCK STREET

PART 2: INCIDENT SITUATION

HIGHWAY USER INVOLVED: AUTO   EQUIPMENT INVOLVED: LIGHTLOCO(S)(MOVING)
SPEED: 030 MPH   VEHICLE DIRECTION: WEST
POSITION OF CAR UNIT IN TRAIN: 001
POSITION: MOVING OVER CROSSING   CIRCUMSTANCE: TRAIN STRUCK BY HIGHWAY USER
WAS HIGHWAY USER AND/OR RAIL EQUIPMENT INVOLVED IN THE IMPACT TRANSPORTING HAZARDOUS MATERIALS? NEITHER

PART 3: ENVIRONMENT

TEMPERATURE: 060 F   VISIBILITY: DAY   WEATHER: CLEAR

PART 4: TRAIN AND TRACK

TYPE OF TRAIN: LIGHT LOCOMOTIVE(S)   TYPE OF TRACK: MAIN
TRACK NUMBER OR NAME: SINGLE MAIN   FRA TRACK CLASSIFICATION: 1
NUMBER OF CARS: 000   NUMBER OF LOCOMOTIVE UNITS: 01
TRAIN SPEED: 015 MPH (ESTIMATED)   TIME TABLE DIRECTION: SOUTH

PART 5: CROSSING WARNING

TYPE:						
GATES	NO	HWY. TRAFFIC SIGNALS	NO	WATCHMAN	NO
CANTILEVER FLS	NO	AUDIBLE	YES	FLAGGED BY CREW	NO
STANDARD FLS	NO	CROSSBUCKS	NO	OTHER	NO
WIG WAGS	NO	STOP SIGNS	NO	NONE	NO

WAS THE SIGNALED CROSSING WARNING WORKING? YES   LOCATION OF WARNING: BOTH SIDES
WAS CROSSING WARNING INTERCONNECTED WITH HIGHWAY SIGNALS? NO   WAS CROSSING ILLUMINATED BY STREET LIGHTS OR SPECIAL LIGHTS: YES

PART 6: MOTORIST ACTION

MOTORIST PASSED STANDING HIGHWAY VEHICLE: NO
MOTORIST DID NOT STOP
VIEW OF TRACK OBSCURED BY NOTHING
MOTORIST DROVE BEHIND OR IN FRONT OF TRAIN AND STRUCK OR WAS STRUCK BY SECOND TRAIN: NO

PART 7: HIGHWAY VEHICLE PROPERTY DAMAGE/CASUALTIES

HIGHWAY VEHICLE PROPERTY DAMAGE: $1000.00   DRIVER WAS UNINJURED
TOTAL NUMBER OF OCCUPANTS KILLED: 0000   WAS DRIVER IN THE VEHICLE ? YES
TOTAL NUMBER OF OCCUPANTS INJURED: 0000   TOTAL NUMBER OF OCCUPANTS INCLUDING DRIVER: 0004

ITEMNO. 00001667

Attachment H-3

TRAIN- VEHICLE ACCIDENT TABLE

Crossing Location	Present Safety Device	AADT	Annual Accident Frequency Rate Pre-Merger	Post-Merger With No Further Mitigation	Post-Merger With Increased Train Speeds	Post-Merger with Increased Train Speeds and Additional Gates
Greenwich	Flashers	835	0.0188	0.0225	0.0225	0.0093
101st North	X - Bucks	561	0.0278	0.0392	0.0440	0.0440
61st North	Gates	2139	0.0535	0.0632	0.0632	0.0632
Oliver	Gates	1587	0.0176	0.0238	0.0238	0.0238
45th North	Gates	2519	0.0155	0.0210	0.0210	0.0210
Hillside	Gates	3391	0.0153	0.0213	0.0213	0.0213
37th North	Gates	3836	0.0579	0.0689	0.0689	0.0689
21st North	Gates	14747	0.0362	0.0437	0.0437	0.0437
19th North	X - Bucks	275	0.0146	0.0190	0.0218	0.0218
18th North	X - Bucks	434	0.0636	0.0727	0.0783	0.0783
17th North	Flashers	4169	0.1671	0.1719	0.1719	0.1099
15th North	X - Bucks	495	0.0297	0.0375	0.0421	0.0421
13th North	Gates	16415	0.0344	0.0426	0.0426	0.0426
11th North	Flashers	1943	0.0308	0.0334	0.0334	0.0147
10th North	Flashers	702	0.0219	0.0240	0.0240	0.0100
9th North	Flashers	1768	0.0299	0.0324	0.0324	0.0142
Murdock	Flashers	12000	0.2231	0.2326	0.2326	0.1509
Central	Gates	17362	0.0348	0.0431	0.0431	0.0431
Gilbert	X - Bucks	1215	0.0316	0.0426	0.0476	0.0476
Lincoln	Flashers	12010	0.0595	0.0651	0.0651	0.0344
Bayley	Flashers	589	0.0182	0.0210	0.0210	0.0086
Zimmerly	Flashers	581	0.0181	0.0209	0.0209	0.0086
Boston	X - Bucks	946	0.0312	0.0421	0.0446	0.0446
Harry	Gates	15063	0.0245	0.0360	0.0360	0.0360
Osie	Flashers	676	0.0191	0.0220	0.0220	0.0091
Funston	X - Bucks	622	0.0163	0.0230	0.0245	0.0245
Skinner	Flashers	363	0.0153	0.0177	0.0177	0.0072
Mt Vernon	Flashers	6042	0.0391	0.0439	0.0439	0.0204
Clark	X - Bucks	290	0.0216	0.0299	0.0318	0.0318
Kinkaid	X - Bucks	901	0.0307	0.0416	0.0440	0.0440
Pawnee	Gates	26973	0.0355	0.0451	0.0451	0.0451
MacArthur	Flashers	15285	0.0643	0.0691	0.0691	0.0375
47th South	Gates	12985	0.0302	0.0387	0.0387	0.0387
55th South	Flashers	4943	0.0345	0.0400	0.0400	0.0182
63rd South	Gates	6016	0.0191	0.0257	0.0257	0.0257
71st South	Gates	10945	0.0280	0.0366	0.0366	0.0366
79th South	X - Bucks	1043	0.1554	0.1878	0.2017	0.2017
103rd South	Flashers	1372	0.0227	0.0268	0.0268	0.0114
Meridian	X - Bucks	837	0.0323	0.0442	0.0494	0.0494
119th South	Flashers	158	0.0103	0.0124	0.0124	0.0049
TOTAL			1.65	1.95	2.00	1.61

Appendix I Derailment and Hazardous Materials Risk Estimates

Appendix I
DERAILMENT AND HAZARDOUS MATERIALS RELEASE RISK ESTIMATES

Methodology

Estimates of average annual derailments apply per-unit derailment rates for various strata of mainline FRA Class 3 or Class 4 trackage to estimated units for each of three track segments in Sedgwick County: north (MP 226.75 to MP 241.0); central (MP 241.0 to MP 251.0); and south (MP 251.0 to MP 259.23). The derailment rates use calendar 1994-96 accident/incident reports to the FRA for mainline tracks (i.e. track type "1" in the accident/incident database); reported accidents were divided by the estimated nationwide units of operation to obtain nationwide rates, then were adjusted by various factors based on the actual accident experience of the segments. A summary of these calculation results appears as Table I-1; derivation of the reduction factor is in Attachment A.

Table I-1. Estimated Derailment Rates for Class 3 Mainlines, 1994-96

Type(s) of Derailment	Applicable Operational Unit	Estimated Nationwide Units, 1994-96	Reported Derailments, 1994-96	Estimated National Rate, 1994-96
Control-dependent ("dark" territory)	train-miles	84,209,000	34	4.04×10^{-7}
Control-independent	train-miles	270,574,000	96	3.55×10^{-7}
Control-independent	car-miles	17,542,000,000	307	1.75×10^{-8}

Application to Pre-Merger Trains

For pre-merger trains, units of operation in each segment were estimated as shown in Table I-2; separate estimates were prepared for trains that include hazardous materials in their consists (designated in Table I-2 as local and manifest trains) and trains not carrying such materials (unit trains). The derailment rates were applied to the estimated quantities, with results as shown in Table I-2.

Table I-2. Pre-Merger Mainline Derailment Estimate

	North Segment	Central Segment	South Segment	Totals
Quantities (Annual)				
Local & manifest train-miles	16,962	18,516	11,762	
Unit train-miles	6,552	6,113	11,962	
Car-miles in local & manifest trains	716,607	658,542	715,641	
Car-miles in unit trains	589,680	550,204	1,025,068	
Estimated Average Annual Derailment Rate				
Local & manifest trains	0.02446	0.06536	0.02066	0.11048
Unit trains (no HMs)	0.01472	0.03507	0.02602	0.07581
Total	0.03918	0.10044	0.04667	0.18629
Equivalent Years Between Derailments	25.5	10.0	21.4	5.37

Application to Post-Merger Trains Without Further Mitigation

Table I-3 shows the derailment analysis for the post-merger trains, including the assumed traffic levels. All other assumptions remained the same as for the pre-merger analysis.

Table I-3. Post-Merger Without Further Mitigation Mainline Derailment Estimate

	North Segment	Central Segment	South Segment	Totals
Quantities (Annual)				
Local & manifest train-miles	32,172	31,215	30,842	
Unit train-miles	12,695	11,000	18,324	
Car-miles in local & manifest trains	2,424,807	2,065,350	2,778,502	
Car-miles in unit trains	1,234,643	1,063,308	1,705,056	
Estimated Average Annual Derailment Rate				
Local & manifest trains	0.06435	0.14892	0.06936	0.28263
Unit trains (no HMs)	0.03008	0.06341	0.05813	0.15162
Total	0.09443	0.21233	0.12749	0.43425
Equivalent Years Between Derailments	10.6	4.7	7.8	2.30

Application to Post-Merger Trains With Increased Train Speeds

Changes to the railroad's physical plant would be necessary to allow increased train speeds. These changes would have a mitigating effect on the derailment frequency. Several of these have been estimated; others are likely to have an additional effect, but cannot be readily estimated from available data.

The entire territory under consideration would be equipped with centralized traffic control (CTC). Based on a comparison of other derailment experience for route segments with and without CTC, the derailment rate from control-related causes is estimated to decrease by 35 percent, i.e. to 2.63×10^{-7} per train-mile.

Operating speeds would increase on various segments. With the exception of the segments being upgraded to 60 mph, which will become FRA track class 4, there is insufficient basis to assume a change in the derailment rates on this account. Because the track would be renewed, and would be continuous welded rail (CWR), the improvements would very likely more than offset any increased risks that might be associated with increased speed. Examination of accident data has not suggested that speed has a significant effect on derailment rate, but higher speeds are associated with a tendency for more of a train's consist to derail if a derailment occurs.

Between approximately mileposts 239 and 223, and in the southern segment, tracks will be upgraded to FRA Class 4, permitting operation at 60 mph. This change is estimated to reduce the derailment rate for car-mile-related derailments by 6 percent, and for train-mile-related derailments not related to control methods by 35 percent.

Table I-4 shows the unit rates adjusted to represent the improved physical plant, for comparison with Table I-1. Table I-5 shows the derailment analysis for the post-merger trains with increased train speeds and post-merger traffic levels.

Table I-4. Estimated Derailment Rates for Post-Merger With Increased Train Speeds (excluding Empirical Bayes Adjustment)

Type(s) of Derailment/Territory	Applicable Operational Unit	Estimated Post-Merger Rate with Increased Train Speeds
Control-dependent (CTC)	train-miles	2.63×10^{-7}
Control-independent/Class 3	train-miles	3.55×10^{-7}
Control-independent/Class 3	car-miles	1.75×10^{-8}
Control-independent/Class 4	train-miles	2.20×10^{-7}
Control-independent/Class 4	car-miles	1.64×10^{-8}

Table I-5. Post-Merger with Increased Train Speeds Mainline Derailment Estimate

	North Segment	Central Segment	South Segment	Totals
Quantities (Annual)				
Local & manifest train-miles	32,172	31,215	30,842	
Unit train-miles	12,695	11,000	18,324	
Car-miles in local & manifest trains	2,424,807	2,065,350	1,778,502	
Car-miles in unit trains	1,234,643	1,063,308	1,705,056	
Estimated Average Annual Derailment Rate				
Local & manifest trains	0.05372	0.12399	0.05871	0.23641
Unit trains (no HMs)	0.02561	0.05613	0.03545	0.11718
Total	0.07932	0.18012	0.09415	0.35359
Equivalent Years Between Derailments	12.6	5.6	10.6	2.83

Net Estimated Change from Merger-Related Increased Train Traffic and Increased Train Speeds

The estimated net annual changes in derailments are shown in Table I-6. The total mainline derailment experience is expected to increase from one per 5.37 years to one per 2.83 years as a result of the increased traffic through these segments. Accident experience is, however, inherently random; the experience in any one year is largely independent of experience in any other year. Even on a nationwide basis, there is considerable variance in year-to-year total accident experience as a result of this randomness.

Table I-6. Summary of Annual Expected Mainline Derailment Estimates

	Pre-Merger	Post-Merger with Increased Train Speeds	Net Change	Percent Change
Trains with HM	0.110	0.236	0.126	115
Non-HM trains	0.076	0.117	0.041	54
Total	0.186	0.354	0.168	88

Hazardous Materials (HM) Releases in Mainline Derailments

Table I-7 summarizes nationwide experience in HM releases in derailments for 1994-96 on Class 3 and Class 4 mainlines. It indicates that on average about two percent (0.02) of cars carrying HMs release some HM material, given they are in a train consist that experiences a derailment. The conditional probability of a HM release given that an HM-laden car actually derails appears to be about 16 percent (0.16).

Table I-7. Summary of National Derailment and Hazmat Release Data, 1994-96

	Class 3	Class 4	Combined
Number of Derailments	493	540	1,033
Total Freight Cars Involved (1)	35,236	40,282	75,518
Total Cars Derailed	3,932	4,766	8,698
Hazmat Cars Involved (1)	918	1,759	2,677
Hazmat Cars Damaged (2)	183	342	525
Hazmat Cars Releasing	19	33	52
Evacuations (3)	7	18	25
Percent of Cars Derailing	11.2%	11.8%	11.5%
Percent of Cars Hazmat	2.6%	4.4%	3.5%
Percent of Hazmat Cars Damaged	19.9%	19.4%	19.6%
Hazmat Releases per Involved Hazmat Car	0.021%	0.019	0.019
Evacuations per Hazmat-Releasing Car	0.368	0.545	0.481
Estimated Hazmat Releases per Derailed Hazmat Car	0.185	0.159	0.169

(1) *Involved* means that the cars were part of the train which experienced a derailment.
(2) *Damaged* cars may not have derailed.
(3) This is the number of incidents of evacuation, including precautionary evacuations.

For pre-merger trains, expected average annual HM releases were estimated by applying the 0.16 conditional release probability to the estimated number of derailed HM cars, as shown in Table I-8. Based on the pre-merger operating speeds for the segments, the estimated fractions of the train consists that actually derail are expected be less than indicated in Table I-7; specifically: 6.6 percent for the northern and southern segments, and 5.5 percent for the central segment. The same technique and assumptions were applied for the post-merger case without further mitigation.

With increased train speeds, operating speeds over much of the study territory will be higher, resulting in an increase in the estimated fraction of consists derailing; specifically: 9.1 percent in the northern segment, 7.0 percent in the central segment, and 9.2 percent in the southern segment. These increased fractions offset the lower derailment rate under the post-merger case with increased train speeds. The results in Table I-8 indicate an increase in HM release of 288 percent between the pre-merger and post-merger-with-increased-train-speeds cases, i.e. from one release related to a mainline derailment expected each 331 years, to one expected each 88 years.

Table I-8. Summary of Estimated Hazmat Traffic Statistics and Releases in Mainline Derailments

	North	Central	South	Combined
Pre-merger				
Hazardous materials (HM) car-miles	83,216	39,194	29,016	151,426
Car-miles in trains containing HMs	716,607	658,542	715,841	2,090,990
Percent HM cars	11.6%	6.0%	4.1%	7.2%
Average Consist (cars)	42.2	35.6	60.8	NA
Expected HM cars derailed per year	0.0079	0.0076	0.0034	0.0189
Expected HM releases per year	0.00127	0.00122	0.00054	0.00302
Post-merger without further mitigation				
Hazardous materials (HM) car-miles	180,267	107,977	116,808	405,052
Car-miles in trains containing HMs	2,424,807	2,065,350	2,778,502	7,268,659
Percent HM cars	7.4%	5.2%	4.2%	5.6%
Average Consist (cars)	75.4	66.2	69.7	NA
Expected HM cars derailed per year	0.0238	0.0283	0.0134	0.0656
Expected HM releases per year	0.00381	0.00454	0.00215	0.01049
Post-merger with increased train speeds				
Hazardous materials (HM) car-miles	180,167	107,977	116,808	404,952
Car-miles in trains containing HMs	2,424,807	2,065,350	2,778,502	7,268,659
Percent HM cars	7.4%	5.2%	4.2%	5.6%
Average Consist (cars)	75.4	66.2	69.7	NA
Expected HM cars derailed per year	0.0274	0.0300	0.0159	0.0733
Expected HM releases per year	0.00438	0.00481	0.00254	0.01173

Attachment A

There are two sources of information which can be used to estimate accident rates for a route: its physical and traffic attributes (e.g. track class and traffic statistics as described in the memo), and the local accident history. The *empirical Bayes* procedure can be applied to modify the calculated estimate to incorporate knowledge of the actual accident history. In effect, a calculated attribute-based rate, R, can be adjusted to reflect the fact that a number of accidents (N) occurred over a number of years of history (T) as follows:

$$R_{adjusted} = \frac{R\ T_0 + N}{T + T_0}$$

where T_0 is a quantity that depends on the link, and can estimated as the ratio of the mean accident rate to the variance of the distribution of the accident rate. For a set of randomly selected links on the UP/SP system, T_0 was estimated as 78. This means that the occurrence of accidents is so random that large differences in accident history can be expected to have a relatively small effect on the expected accident rate.

In the case of the northern and southern segments in Sedgwick County, there were no mainline derailments reported in three sample years (1994-96). For these segments, application of the empirical Bayes procedure to the unadjusted pre-merger derailment rates indicates an effective reduction of 3.7 percent. On the central segment three derailments were reported in the three year period (all in 1994); this indicates an effective increase of 111.7 percent.

Appendix J Air Quality

Appendix J

Acurex Environmental Technical Report TR-97-126

UNION PACIFIC/SOUTHERN PACIFIC WICHITA MITIGATION STUDY

AIR QUALITY ANALYSIS REPORT

Submitted to

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CONTENTS

Section 1
INTRODUCTION

As part of the UP/SP Merger Wichita Mitigation Study, the SEA study team analyzed estimated air quality impacts in Wichita, Kansas, resulting from the increase in rail traffic along the OKT line and general mitigation options defined during the study process. This appendix describes the background, methodologies, and results of these analyses.

Section 1 of this appendix introduces the pollutants studied, the Federal air quality standards associated with these pollutants, and the current air quality issues in Wichita. Section 2 describes the methodologies used to model the impacts of the merger. Sections 3 and 4 present the results of these analyses for pre-/post-merger scenarios and the results as affected by the general mitigation options. Section 5 examines several air-quality-specific mitigation options that could reduce emissions generated by locomotives.

1.1 Criteria Pollutants and National Standards

The study considered the following pollutants: VOCs, NO_x, ozone (O_3), PM, and CO. The study analysis did not consider sulfur oxides, lead, or air toxics.

VOCs are generally hydrocarbons (HC), which are linked molecules of carbon with hydrogen atoms attached to each of the carbon atoms in branches. They can range from the simplest, methane (CH_4), to extremely complex molecules with tens to hundreds of carbon atoms. Gasoline evaporation and paint sprays are two common sources of hydrocarbon emissions. A number of hydrocarbons are known cancer-causing agents (Reference 1). This study used VOCs as the specific study pollutant.

NO_x, of which a primary component is nitrogen dioxide (NO_2), is formed when combustion temperatures are very high, which occurs with diesel engines. In this process, nitrogen and oxygen molecules dissociate in the air and combine to form NO_x. NO_2 is known to be a hazard to human health (Reference 2). Furthermore, when mixed together in the atmosphere and provided sunlight, VOCs and NO_x, in a complex chemical reaction, form ground-level ozone (O_3) (Reference 3), a known lung irritant (Reference 4). Thus, conventional ozone-reducing strategies focus upon reduction of VOCs and NO_x directly from non-naturally occurring sources to minimize this ozone-forming process.

PM is composed of small particles that come in all forms and originate from numerous sources, including dust that is blown off city streets and ash from residential wood fireplaces. PM is characterized according to size in microns (μm) (e.g., PM_{10} refers to all particulate matter less than or equal to 10 μm in size). Diesel engines are a common source of PM. Diesel particulate is composed of a soluble organic fraction (SOF), which is bits of carbon with a layer of unburned hydrocarbon (UHC) on the surface, and an inorganic fraction (essentially ash). These particles, when inhaled, penetrate deep into the lungs, deposit on the surface of the tracheobronchiol tree, and affect lung function (Reference 5).

CO is another product of incomplete combustion. When breathed, CO readily binds to hemoglobin, the oxygen-carrying substance in the bloodstream. This prevents oxygen from attaching to the molecule and can eventually cause asphyxiation (Reference 6). CO problems generally occur close to sources of the pollutant, such as gasoline vehicles, and in areas with little wind to disperse the pollutant. Thus, proper study of this pollutant requires performing dispersion modeling near the major sources of carbon monoxide (in this study, the idling vehicles at railroad crossings).

The national regulations addressing these criteria pollutants are the National Ambient Air Quality Standards (NAAQS). These health-based limits define maximum allowable ambient air concentrations for each pollutant, which have been determined by scientific studies estimating human exposure level and health impacts. Table 1-1 of this appendix shows the current NAAQS and the recently proposed stricter NAAQS[1]. The Clean Air Act of 1970 and its subsequent amendments call upon local and state governments to develop implementation plans for each area in which ambient concentrations exceed the NAAQS (so-called nonattainment areas, or NAAs). The implementation plans are series of regulations or programs that reduce emissions from sources in the local region. The governments have significant discretion in developing plans that are tailored to the situation in their region, but each plan must obtain approval from the EPA (Reference 7). In the late 1970s and early 1980s, Wichita was designated as being in nonattainment for CO.

Table 1-1. National Ambient Air Quality Standards

Pollutant	Current	Proposed
O_3	0.12 ppm, 1-hr average	0.08 ppm, 8-hr average
CO	9 ppm, 8-hr average 35 ppm, 1-hr average	Unchanged
NO_2	0.053 ppm, annual arithmetic mean	Unchanged
PM_{10}	50 $\mu g/m^3$, annual arithmetic mean 150 $\mu g/m^3$, 24-hr average	Unchanged
$PM_{2.5}$	—	15 $\mu g/m^3$, annual arithmetic mean 65 $\mu g/m^3$, 24-hr average
SO_2	0.030 ppm, annual arithmetic mean 0.14 ppm, 24-hr average	Unchanged
Lead	1.5 $\mu g/m^3$, calendar quarter	Unchanged

Sources: Current NAAQS are from 40 CFR 50. Proposed NAAQS are from EPA website, URL address: http://ttnwww.rtpnc.epa.gov/naaqsfin/o3pm.htm, July 1, 1997.

[1] The new EPA-proposed NAAQS for ozone and $PM_{2.5}$ were approved by President Clinton on June 25, 1997, and are undergoing interagency review at the time of this writing. Many areas of the nation that are now in attainment status are expected to become nonattainment areas if this proposal is implemented. It is possible that Congressional action will modify or eliminate the NAAQS revisions.

1.2 Environmental Analysis and Post Environmental Analysis

Prior to this study, the Surface Transportation Board (Board) Section of Environmental Analysis (SEA) performed air quality analyses in the Environmental Analysis (EA) and the Post Environmental Analysis (Post EA). To determine significant emissions increases from the merger, the EA analyzed percentage increases in train traffic according to rail line segments and Air Quality Control Regions (AQCRs). AQCRs, designated by the EPA, are contiguous areas of the country having similar topography and air quality management needs. For each line segment, the increase in train traffic was measured and compared to specific thresholds (specified in 49 CFR 1105.7(e)(5)(i) and (ii)), that are a function of whether the AQCR that contains the line segment is designated a nonattainment area. The thresholds are shown in Table 1-2. If the increase in a line's train traffic exceeded the appropriate threshold, then a series of calculations was performed to quantify the emissions increase on the segment. Emissions were calculated by multiplying the number of gross ton-miles (GTM) on each line segment, the average fuel consumption in gallons/GTM for the entire railroad system, and emissions factors in terms of pounds of pollutant per gallon of fuel from a study by the California Air Resources Board (ARB) (Reference 8). The analysis of the results stated only whether or not an emissions increase appeared to exist. This was the case for AQCR 99, South Central Kansas, which contains Sedgwick County. Emissions from vehicle queues at grade crossings were not considered.

Table 1-2. Board air quality thresholds for impact analysis for rail line segments

Attainment Areas (49 CFR 1105.7(e)(5)(i)):
Increase of 8 trains per day or 100% increase in annual gross ton miles
Nonattainment Areas (49 CFR 1105.7(e)(5)(ii)):
Increase of 3 trains per day or 50% increase in annual gross ton miles

The Post EA recalculated emissions figures in the same manner, but did so for all line segments, regardless of whether a threshold was exceeded. This allowed for the effects of reduced emissions on certain line segments that were projected to have less post-merger train traffic. Emissions from all line segments in each AQCR were then summed, and the net increase (or decrease) in emissions was calculated for the AQCR.

The EA and Post EA did not estimate emissions or air quality impacts specifically in Wichita or Sedgwick County.

1.3 Air Quality in Wichita and Sedgwick County

1.3.1 Topography and Climate

Situated in the great plains of Kansas, the topography of Wichita, Sedgwick County, is essentially level (see Figure 1-1). Since the area lacks mountains or large hills, the terrain helps

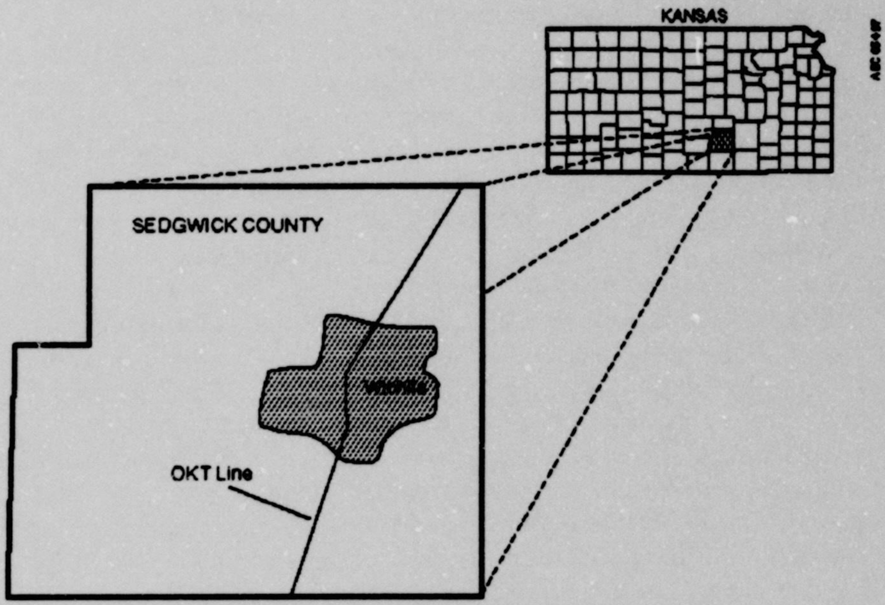

Figure 1-1. Wichita, Sedgwick County, and the OKT study line

alleviate certain potential air quality problems. Average daily temperatures are about 30°F in the winter and 70°F in the summer. Due to the prevailing wind, and the lack of surrounding hills, pollutants are continually swept out of the area, making the greater Wichita area a relatively low air quality hazard.

1.3.2 Current Air Quality

Under the 1977 Clean Air Act Amendments, Wichita was categorized as a nonattainment area for one criteria pollutant-CO. CO violations occurred in the central business district of Wichita (see Figure 1-2)[2]. The Wichita-Sedgwick County Metropolitan Area Planning Department, in conjunction with the State of Kansas, developed a plan to attain the Federal ambient standard by 1982. Because most CO emissions come from on-road vehicles, a number of transportation control measures were put in place, including street improvements, traffic signal improvements, transit improvements, a ridesharing program, and an inspection and maintenance program (Reference 9). In the late 1980s, Wichita was designated as a maintenance area by the EPA, and no further air quality problems have occurred since. Currently, Sedgwick County is designated as a maintenance area for CO, and as an attainment area for all other criteria pollutants (Reference 10).

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[2] The original CO nonattainment area identified here extends from Kellogg to 13th Street North, and from the Arkansas River to Grove. In 1985, the Wichita Planning Department requested redesignation of the CO nonattainment area to the "Proposed Nonattainment Area" in Figure 1-2. This smaller nonattainment area is not used for the purposes of this study.

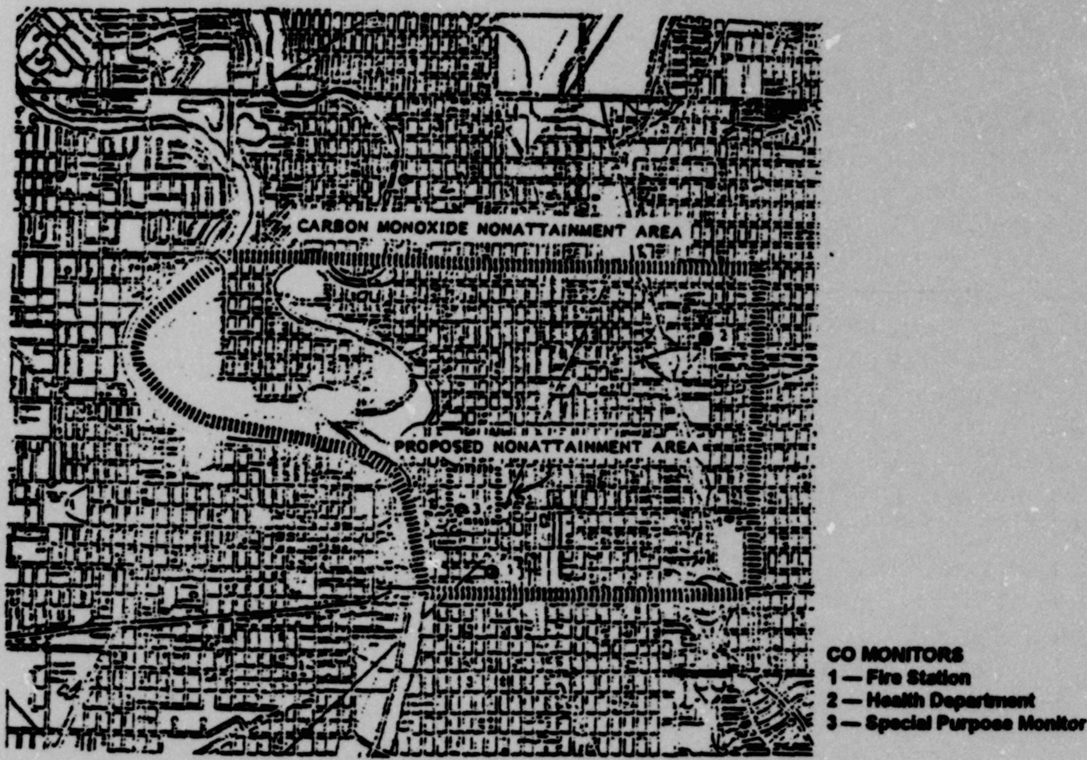

**Figure 1-2. Wichita former CO nonattainment area (as of 1985)
(Source: Reference 9)**

Table 1-3 of this appendix shows recent peak air quality monitor readings for Sedgwick County. These data show that the County is comfortably in attainment with the current standards.

Table 1-3. Recent peak ambient air quality monitoring data for Sedgwick County

Pollutant	Peak Readings	Years of Data Reviewed
O_3	0.09 ppm, 1-hr average	1991-1994
CO	High: 9.3 ppm, 8-hr average Second high: 6.4 ppm, 8-hr average	1995-1996
PM_{10}	High: 145 $\mu g/m^3$, 24-hr average Second high: 119 $\mu g/m^3$, 24-hr average	1995-1996

Source: Wichita-Sedgwick County Department of Community Health.

The impacts on Sedgwick County of the new proposed NAAQS for ozone and $PM_{2.5}$ are uncertain. Based on EPA and SEA study team analyses of recent monitoring data, it appears that Sedgwick County would still be in attainment for O_3 under the new standards. Because Sedgwick County does not have $PM_{2.5}$ monitoring data, it is impossible to project with accuracy whether Sedgwick County would meet the proposed $PM_{2.5}$ standard. Depending on the fraction of ambient PM_{10} levels in Sedgwick County that consists of $PM_{2.5}$, the County may be in nonattainment under the proposed $PM_{2.5}$ standard. The EPA has projected, based on 1993-1995 monitoring data[3], that Sedgwick County would be classified as a nonattainment area, but a definitive answer would not be available until after monitoring stations have been established and ambient data taken.

1.3.3 Selection of Emissions Analysis Study Areas and CO Dispersion Modeling Locations

To analyze the potential air quality impacts of the UP/SP merger in Wichita, the SEA study team performed two types of analysis. To evaluate pollutants that are primarily regional in nature, the study team calculated overall emissions impacts for two different study areas. The first area was Sedgwick County, which corresponds to the jurisdictional area of the Sedgwick County Department of Community Health. The second (smaller) area was the former CO nonattainment area identified above. The SEA study team chose this second area because it is the area in which the highest CO concentrations are likely to occur. At the County level, the SEA study team analyzed VOCs, NO_x, PM, and CO. Within the former CO nonattainment area, the SEA study team analyzed CO emissions only.

The SEA study team selected three railroad crossings within Wichita for which to perform localized CO dispersion modeling. These grade crossings, expected to have the highest ambient CO concentrations among the grade crossings in Wichita, are Pawnee, Central, and 13th Street North.

Section 2
CALCULATION METHODOLOGY

No firm guidelines exist for conducting air quality analysis for mitigation studies of this type. The study team used established best practices in air quality inventory development and localized CO modeling. The methodology used in this mitigation study differs from the EA and Post EA analyses in the following ways:

- It focus specifically on Wichita and Sedgwick County.
- It includes of emissions from queuing automobiles.
- It analyzes of local mitigation options.

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[3] Source: EPA website. URL address: http://ttnwww.rtpnc.epa.gov/naaqspro/pmlist.htm, June 23, 1997. The EPA projections are based on an earlier proposed limit of 50 $\mu g/m^3$ (24-hr average), rather than the currently proposed limit of 65 $\mu g/m^3$ (24-hr average).

- It incorporates of local seasonal conditions and topography.
- It uses a model of potential CO "hot spots" at grade crossings.

The fundamental objectives of the Wichita Mitigation Study are to evaluate the impact of the increase in UP through trains on the study line, which is the OKT line shown in Figure 1-1 of this appendix and to evaluate options to mitigate this impact. Consistent with this objective, the study team's analysis focused exclusively on impacts related to UP through trains on the OKT line. The analysis ignored emissions related to switching operations and through trains on other Sedgwick County rail lines, which are not expected to be affected by the UP/SP merger. The study ignored emissions related to on-road vehicle idling caused by switching and other through train activity and any potential impact of the UP/SP merger on truck traffic and truck emissions in Sedgwick County. The year 2000 served as the baseline analysis year.

2.1 EMISSIONS SOURCES

The emissions model used for this study calculates emissions from both locomotives and idling on-road vehicles at the grade crossings. Locomotives in the United States are overwhelmingly diesel-electric powered, which means that they contain a large diesel engine connected to a generator, the combination of which provides electric power to tractive electric motors at the drive wheels. Ideally, an emissions estimate for in-use locomotives would use emission factors based upon the "throttle notches" (power levels) of the engine, the time spent in each notch, and the notch-specific emission factors for the engine. However, for this study, this information was unavailable, so an alternative method was employed based on fuel consumption estimates provided by UP for various train types. This information serves to estimate total emissions from the merger-related activity of the trains.

Railroad-related emissions from on-road vehicles come from the waiting time that these vehicles experience while railroad crossing gates are down at grade crossings. During this time, vehicles are idling, and the increase in through trains resulting from the merger has the potential to increase vehicle emissions. Estimating these emissions requires utilizing estimates of total vehicle delay, and combining these values with emission factors developed from the EPA's mobile source inventory model, MOBILE5a.

2.2 EMISSIONS ANALYSIS

The emissions calculation model combines the sum of locomotive and on-road vehicle emissions. The model uses numerous input parameters to represent accurately the sources and quantity of emissions. Table 2-1 below lists these parameters, their values, and the source of these data.

Described below are the input parameters used for the model developed by the SEA study team. MOBILE5a and PART5 input parameters are described in Attachment A of this appendix.

2.2.1 Locomotive Emissions

Table 2-1. Emissions model inputs

Parameter	Values	Source
Pre-merger number of trains/day	4	UP/SP Operating Plan
Post-merger number of trains/day	9.6	UP/SP Operating Plan
Locomotive emission factors (lb/gal)	VOC: 0.0211 CO: 0.0626 NO_x: 0.4931 PM: 0.0116	EPA, *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources, 1992*
Locomotive fuel consumption (gal/through train)	Varies by train speed	UP/SP
On-road vehicle emission factors (g/mi)	VOC: 13.505 CO: 148.555 NO_x: 3.835 PM: 0.059	MOBILE5a runs for Wichita, Year 2000 for 2.5 mph
Total hours of vehicle delay	Varies by scenario	SEA study team analysis

The study team calculated locomotive emissions by multiplying the amount of fuel burned by a train within the study area by locomotive emission factors in pounds of pollutant per gallon of fuel. UP supplied fuel consumption estimates. Emission factors in terms of lb/gal are those recommended by the EPA (Reference 11) for use in State Implementation Plan (SIP) calculations[4]. The study team performed the following calculation for each of the pollutants studied:

$$\frac{train}{day} \times \frac{gal}{train} \times \frac{lb\ pollutant}{gal} \times \frac{tons\ pollutant}{2000\ lb\ pollutant} \times \frac{365\ days}{yr} = \frac{tons\ pollutan}{yr}$$

The EPA has proposed new locomotive emissions standards that would phase in beginning in 2000. Because these standards would not have a significant impact on fleet average locomotive emissions in 2000, the baseline analysis year, the study team did not include the emissions standards in calculations. The standards, and their potential emissions impacts, are described in more detail in Section 5 of this appendix.

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[4] These emission factors are similar to, but not identical to, those used in the EA and Post EA calculations discussed in Section 1.2 of this appendix.

2.2.2 Queuing Vehicle Emissions

The study team calculated vehicle emissions for all queuing vehicles at the grade crossings of the OKT line in the study area. At each crossing, the average total hours of delay for all the vehicles per day was multiplied by an emission factor in grams of pollutant per hour. These scenario-specific emission factors were generated by using the EPA's mobile source emissions models, MOBILE5a and PART5 (see Attachment A of this appendix). The specific values used were averages of January and July runs for 2000, to represent average emissions for the entire year. Given the location, year, average vehicle speeds, and other input parameters, MOBILE5a and PART5 provided fleet-average emission factors for all vehicles in grams per mile. Not having information specific to Sedgwick County on the distribution of vehicle types in the vehicle fleet, the analysis used the default (i.e., national average) distribution in MOBILE5a. For all runs, an average speed of 2.5 miles per hour was used, simulating idling emissions[5]. With this value, the study team converted the g/mi output of MOBILE5a to g/hr. This value was then multiplied by the total hours of delay from the traffic analysis to produce a grams-per-day, or tons-per-year, figure. The following calculation determined emissions from the idling vehicles:

$$\frac{hr\ of\ delay}{day} \times \frac{g\ pollutant}{mi} \times \frac{2.5\ mi}{hr} \times \frac{tons\ pollutant}{9.08 \times 10^{5}\ g\ pollutant} \times \frac{365\ days}{yr} = \frac{tons\ pol}{yr}$$

Attachment A of this appendix includes input and output files for all MOBILE5a and PART5 scenario runs.

2.3 CO DISPERSION MODELING

2.3.1 CAL3QHC Model

The air quality dispersion model selected by the SEA study team for the UP/SP merger mitigation study is the CAL3QHC, Version 2.0, line source ambient air dispersion model. The CAL3QHCv2 program is a microcomputer-based model that predicts concentrations of carbon monoxide (CO) or other inert pollutants generated by motor vehicles at roadway intersections, under both free flowing and idling conditions (Reference 12). The model combines traffic algorithms for estimating vehicular queue lengths at signalized intersections with the CALINE-3 line source dispersion model. CALINE-3 does not permit the direct estimation of the contribution of idling vehicles. However, CAL3QHC enhances CALINE-3 to incorporate queuing and idling contributions to pollutant concentrations at intersections. CAL3QHCv2 has been evaluated by EPA, and found to be a reliable tool for that purpose (Reference 13).

The CALINE-3 line source dispersion model estimates steady state pollution concentrations from line sources (e.g., highways and roads) at designated receptor locations. It is a Gaussian model, and can be applied to receptors downwind of "at grade," "fill," "bridge," and "cut section"

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[5] MOBILE5a does not allow users to model idling emissions at 0 mph. However, EPA recommends that to closely simulate such conditions, the user specify that the vehicles are traveling at an average speed of 2.5 mph.

roadways in relatively uncomplicated terrain. The model accommodates any wind direction, roadway orientation, or receptor location, and has adjustments for averaging time and surface roughness. It can be used for either urban or rural areas (must be specified) and should be limited to simple terrain. Individual segments/conditions of the line source are called links. The model requires several input parameters that must be selected by the modeler. Although guidelines for selection are available, final inputs must be made using engineering judgement. Inputs include: link classes, link coordinates, traffic volumes, emission factors, source height, mixing zone width, wind speed, wind direction, weather stability class, mixing height, pollutant ambient background concentration, and coordinates of each receptor (Reference 14).

The CAL3QHC algorithms estimate the emissions from queued and idling vehicles, and converts them into a line source useable under the CALINE-3 link format. The algorithms do this by estimating the length of queues formed by idling vehicles at signalized intersections, and combining that estimate with idling emission rates of vehicles to build a line source usable by CALINE-3. In addition to the input requirements of CALINE-3, the following data must be supplied for CAL3QHCv2: idling emission rates, number of "moving" lanes in each approach link, intersection signal timing, saturation flow rate, signal type, and arrival type. For those familiar with air modeling, the first two parameters are essentially point source strength (to be converted to a line source strength) and the number of sources. The rest are parameters necessary from queuing theory to convert the individual automotive idling emission rates to a line source strength.

2.3.2 Modeling Parameters

As indicated in Section 1.3.3 of this appendix, the study team conducted modeling for three crossings in Wichita: Pawnee, Central, and 13th Street North. The basic grade crossing geometry used in the modeling is shown in Figure 2-1 below.

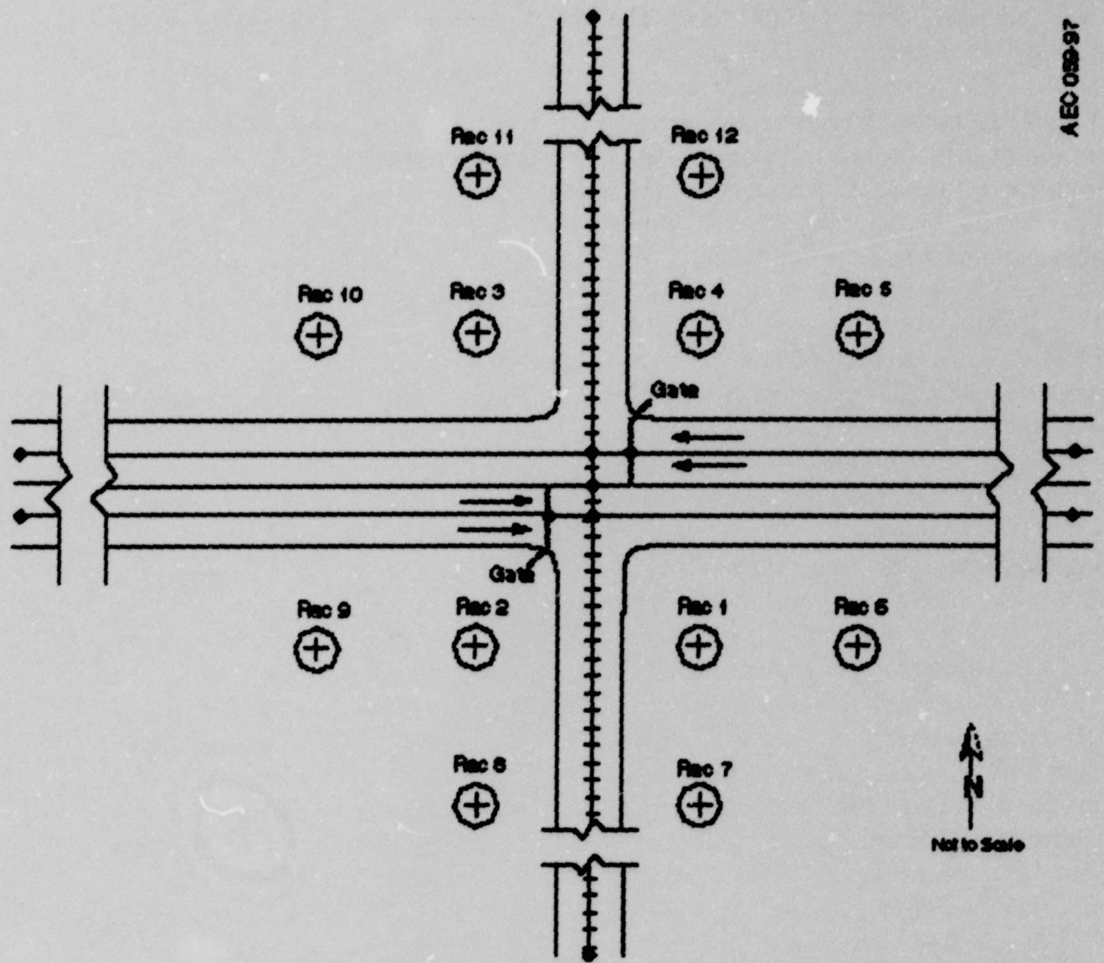

Figure 2-1. Intersection layout and receptor locations for Wichita Mitigation Study CO dispersion modeling

For each scenario considered, the study team chose meteorological inputs, traffic flow data, and vehicle emission factors to project concentrations of CO conservatively high. Conservatism is maintained by such assumptions as having the total daily train volume pass through the intersection during the 8-hour modeling period. Other assumptions for worst-case analysis include the following: all trains have the length of the longest observed through train; the year 2000 traffic volumes for 4 p.m. to midnight were used with CO peaks occurring in early morning; worst-case meteorology representing stagnant air and January temperatures was used; the second-highest 8-hour average CO reading in 1996 (from a monitor located at the intersection of Topeka and Lewis) was used as background CO level[6], and the "double-counting" of localized vehicle contribution to background CO level was not corrected.

Discussed below are the sources and processes by which the study team selected specific input values for the more critical parameters. The actual input parameter values used in each run are listed with the run data in Attachment B of this appendix.

Physical Source Parameters

CALINE-3 Link input physical dimensions (e.g., number of lanes, and width) were generated from field observations and from City of Wichita roadway plans. To remain conservative, a standard maximum length of 1000 feet was also selected. The Wichita area is characterized by simple terrain with gently sloping ground elevations varying less than ±10 feet within a 1,000-foot radius of a given intersection. The land use in the study area is typically urban commercial and industrial. The intersections are thus readily amenable to CAL3QHC modeling, and are set in urban conditions with the surface roughness factor assumed to be 175 (commercial office). Receptor locations were positioned using the CAL3QHC guidelines for placement distances with a pattern of 12 around each intersection (see Figure 2-1).

Meteorology

Worst-case meteorological parameters were selected based on EPA guidelines (Reference 12). A wind speed of 1 meter per second with a D stability class was used. Thirty-six wind directions were screened in ten degree increments, seeking the direction that predicted the highest concentration at any receptor around a given intersection. The receptor/wind direction combination with the highest concentration for the particular scenario is used to calculate the value reported in the results. The value presented in the results in Sections 3 and 4 is an 8-hour average derived from the model-predicted highest receptor 1-hour maximum concentration at each intersection. Using the California Risk Assessment Guidelines for converting one-hour maximum to 8-hour average values, the 1-hour value is multiplied by 0.7 (Reference 15). The model-predicted one-hour maximum values for all receptors and all runs are shown in output printouts in Attachment B of this appendix.

Emission Strengths

Locomotive CO emissions represent less than 2 percent of the on-road vehicle emissions within the model zone. Therefore, locomotive emission strengths were set to zero because the quantities of CO emitted by the locomotives are negligible compared to the on-road vehicle CO emission values. This allows considerable simplification in model set-up without significantly changing the results. In place of an intersection, the model for each intersection devolves to a two link straight line source with two different emission rates (free flowing and queuing). A total of six free flow links and two queuing links were modeled for each crossing. Each link consists of two

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[6] We used the second-highest CO reading because one exceedance of the CO standard per year does not cause nonattainment; two exceedances does. Therefore, to analyze the implications of the UP/SP merger on Sedgwick County's CO attainment status, it is the second-highest value in a given year (otherwise known as the "design value") that is most relevant.

lanes of traffic. A table of link descriptions with variable values is contained in the model output material in Attachment B of this appendix. Automotive emission rates for idling and free-flowing conditions were derived by running the EPA MOBILE5a model (Reference 16).

Queuing and Traffic Flow Dynamics

For CAL3QHC modeling purposes, the three intersections under study were classified as urban business district streets. Traffic volumes for the 4 P.M.-12 midnight period were calculated using City of Wichita traffic counts taken during March, 1997, and adjusted to represent levels expected in 2000. "Red light" time was derived from observations of crossing gate raising and lowering times, and the maximum observed train length on October 26, 1996, which was 7,883 feet. Average train speed through each intersection was derived from field observations by the study team. For the post-merger mitigated scenario, train speeds were set at 30 mph. The queue stopping distance was set as the distance from the center line of the tracks to the first stopped vehicle. The gate cycle time was derived based on the worst-case assumption that all of the daily trains (4.0 pre-merger and 9.6 post-merger) cross the intersection within an 8-hour period.

2.4 SCENARIO DESCRIPTIONS

The study team analyzed the following eight scenarios for this study, all projections for 2000:

1. Pre-merger (4.0 trains/day)
2. Post-merger without further mitigation (9.6 trains/day)
3. Mitigation Option #1: Increased Train Speed (30 mph)
4. Mitigation Option #2: Increased Train Speed plus Grade Separation at Pawnee
5. Mitigation Option #3: Increased Train Speed plus Grade Separations at Pawnee and Central
6. Mitigation Option #4: Increased Train Speed plus Grade Separations at Pawnee, Central, and 13th St. N.
7. Mitigation Option #5: Increased Train Speed plus Grade Separations at Pawnee, Central, 13th St. N., and 21st N.
8. Mitigation Option #5: Increased Train Speed plus Elevated Trainway

Results for the first two scenarios are described in Section 3 of this appendix. The final six scenarios are discussed in Section 4.

Section 3
BASELINE ANALYSIS: PRE-MERGER AND POST-MERGER WITHOUT FURTHER MITIGATION SCENARIOS

The following subsections describe and discuss the results of the SEA study team's analysis of the pre-merger and post-merger without further mitigation scenarios. Section 3.1.1 below details the results of the emissions analysis, and Section 3.1.2 shows the results of the localized CO dispersion modeling. The analysis of mitigation options is discussed in Section 4 of this appendix.

3.1 EMISSIONS ANALYSIS

The results of the pre-merger and post-merger without further mitigation analyses are shown below in Tables 3-1 and 3-2 for both Sedgwick County and the former Wichita CO nonattainment area. Shown are the emissions from locomotives and idling vehicles, and the sum of these two sources. Attachment C of this appendix contains the calculation spreadsheets.

To put these emissions estimates into context, we need to compare them to the total emissions from all sources in Sedgwick County. However, because Sedgwick County is in attainment or maintenance status for all criteria pollutants, the County Department of Community Health and the Kansas Department of Health and Environment calculate emission inventories for some, but not all, sources of emissions. The study team made rough order-of-magnitude estimates of total emissions in Sedgwick County, based on comparisons with other areas that have comprehensive emissions inventories. Based on these rough estimates, the estimated emissions increases resulting from the increased through trains all amount to less than one percent of total Countywide emissions. Furthermore, the estimated increase in CO emissions within the former CO nonattainment area is well below one percent of the estimate of the total CO emissions inventory within that geographic area.

Table 3-1 Total emissions in Sedgwick County related to UP through trains on OKT Line: baseline analysis (tons per year)

VOCs		
	Pre-merger	**Post-merger w/out further mitigation**
Locomotive emissions	3.7	8.9
Idling vehicle emissions	1.1	3.7
Total emissions	4.8	12.6

NO_x		
	Pre-merger	**Post-merger w/out further mitigation**
Locomotive emissions	86.1	206.7
Idling vehicle emissions	0.3	1.1
Total emissions	86.5	207.8

PM_{10}		
	Pre-merger	**Post-merger w/out further mitigation**
Locomotive emissions	2.0	4.9
Idling vehicle emissions	0.01	0.02
Total emissions	2.0	4.9

CO		
	Pre-merger	**Post-merger w/out further mitigation**
Locomotive emissions	10.9	26.2
Idling vehicle emissions	12.1	40.9
Total emissions	23.1	67.2

Source and notes:

1. Calculations considered only UP through trains on OKT line.
2. Number of trains per day (for calculating locomotive emissions): 4.0 pre-merger, 9.6 post-merger, based on UP revised OKT operating plan estimates for Central Wichita.
3. Locomotive emission factors (lb/gal) are from *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, 1992, EPA. The proposed EPA locomotive emissions standards will not significantly affect locomotive emission rates in 2000. Hydrocarbon emission rates are converted to VOCs by multiplying by 1.005.
4. Locomotive fuel consumption (gal/train) is a weighted average based on the relative frequency of various train types, as specified in the UP revised OKT operating plan.
5. On-road vehicle emission rates are based on EPA MOBILE5a model runs for idling conditions (2.5 mph as specified by EPA). Runs for January 2000 and July 2000 were averaged to estimate the average daily emissions for the entire year.
6. Estimates of total hours of delay for queuing automobiles were calculated by the study team.
7. Numbers may not sum precisely due to rounding.

Table 3-2 Total CO Emissions in Wichita former CO nonattainment area related to UP through trains on OKT Line: baseline analysis (tons per year)

	Pre-merger	Post-merger w/out further
Locomotive emissions	0.7	1.7
Idling vehicle emissions	3.0	13.3
Total emissions	4.6	15.0

Source and notes:

1. Calculations considered only UP through trains on OKT line.
2. Number of trains per day (for calculating locomotive emissions): 4.0 pre-merger, 9.6 post-merger, based on UP revised OKT operating plan estimates for Central Wichita.
3. Locomotive emission factors (lb/gal) are from *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, 1992, EPA. The proposed EPA locomotive emissions standards will not significantly affect locomotive emission rates in 2000. Hydrocarbon emission rates are converted to VOCs by multiplying by 1.005.
4. Locomotive fuel consumption (gal/train) is a weighted average based on the relative frequency of various train types, as specified in the UP revised OKT operating plan.
5. On-road vehicle emission rates are based on EPA MOBILE5a model runs for idling conditions (2.5 mph as specified by EPA). Runs for January 2000 and July 2000 were averaged to estimate the average daily emissions for the entire year.
6. Estimates of total hours of delay for queuing automobiles were calculated by the study team.
7. Numbers may not sum precisely due to rounding.

Based on the evaluation of recent ambient air quality monitoring data, Sedgwick County comfortably meets the current NAAQS, as discussed in Section 1.3.2 of this appendix. The comparatively small emissions increases resulting from the UP/SP merger are very unlikely to affect Sedgwick County's attainment status under the current standards.

In light of the new recently approved NAAQS, it is difficult to assess the implications of the merger on Wichita's attainment status. While EPA has estimated that Wichita would be classified as non-attainment for PM *even without the merger* (as discussed in Section 1.3.2 of this appendix), a definitive answer would not be available until after monitoring stations have been established and ambient data taken. However, it is quite unlikely that the merger-related PM emissions increase would mean the difference between attainment and nonattainment under the proposed $PM_{2.5}$ standards.

3.2 CO DISPERSION MODELING

The results of the study team's CO dispersion modeling for the baseline scenarios are shown in Table 3-3 below. Printouts of CAL3QHC input and output files are included in Attachment B of this appendix. These results indicate that the increase in through trains could elevate CO levels under worst-case conditions by approximately 0.5 to 0.6 ppm, to a peak level of 8.2 ppm at the Pawnee intersection. All of the results are within the EPA standard of 9 ppm. Note that the background CO level of 6.4 ppm represents most of the total CO levels in Table 3-3. Thus, it appears that the increase in through trains resulting from the UP/SP merger would be very unlikely to have an impact on Wichita's CO attainment status.

Table 3-3 Estimated worst-case CO concentrations at selected OKT line grade crossings in Wichita: baseline analysis (ppm, 8-hr average)

	Pre-merger	Post-merger w/o further mitigation
13th Street North	7.3	7.8
Central	7.5	8.1
Pawnee	7.7	8.2

Sources and notes:
1. NAAQS for CO is 9 ppm (8-hour average).
2. Results are based on screening-level dispersion modeling using the CAL3QHC model.
3. Assumptions for worst-case analysis include:
   - All trains (4.0 pre-merger and 9.6 post-merger) pass grade crossing within an 8-hour period.
   - All trains have the length of the longest observed through train (7,883 ft on October 26, 1996).
   - Year 2000 traffic volumes for 4 p.m. to midnight used, although recent CO peaks have occurred in early morning.
   - Worst-case meteorology used: stagnant air, January temperatures.
   - Second highest 1996 8-hour average from CO monitor at Topeka and Lewis used as background CO level: 6.4 ppm, which occurred from 8 p.m. to 4 a.m. on February 8-9, 1996.
   - "Double-counting" of localized vehicle contribution to background CO level not corrected for.

Section 4
ANALYSIS OF GENERAL MITIGATION OPTIONS

This section discusses our analysis of the three general mitigation options listed in Section 2.4 of this appendix.

4.1 EMISSIONS ANALYSIS

Tables 4-1 below show the effect of the three mitigation options on the emissions related to UP through trains under UP's post-merger operating plan. Figure 4-1 graphically illustrates our results. Attachment C of this appendix contains the calculation spreadsheets.

Tables 4-1 and 4-2 and Figure 4-1 below show that increasing train speed to 30 mph completely mitigates the projected increase in on-road *vehicle* emissions associated with the merger. Inclusion of grade separations or an elevated trainway incrementally improve these emissions below this value.

None of the mitigation options has any substantial effect on *locomotive* emissions, which represent a large portion of the merger-related emissions in all pollutant categories, especially NO_x and PM_{10}. Section 5 of this appendix discusses several mitigation options that could be used to mitigate the increase in locomotive emissions.

4.2 CO DISPERSION MODELING

Table 4-3 summarizes the results of the SEA study team's CO dispersion modeling for the general mitigation options. Figure 4-2 graphically illustrates these results. Printout of CAL3QHC input and output files are included in Attachment B of this appendix.

Table 4.1 Total emissions in Sedgwick County related to UP through trains on OKT line: mitigation options analysis (tons per year)

VOC	Pre-merger	Post-merger w/o further mitigation	Increased train speed	Pawnee separation	Pawnee and Central separations	Pawnee, Central, and 13th separations	Pawnee, Central, 13th, and 21st separation	Elevated trainway
Locomotive emissions	3.7	8.9	10.5	10.5	10.5	10.5	10.5	10.5
Idling vehicle emissions	1.1	3.7	1.0	0.8	0.7	0.6	0.5	0.6
Total emissions	4.8	12.6	11.5	11.3	11.2	11.1	11.0	11.1

NO_x	Pre-merger	Post-merger w/o further mitigation	Increased train speed	Pawnee separation	Pawnee and Central separations	Pawnee, Central, and 13th separations	Pawnee, Central, 13th, and 21st separation	Elevated trainway
Locomotive emissions	86.1	206.7	244.7	244.7	244.7	244.7	244.7	244.7
Idling vehicle emissions	0.3	1.1	0.3	0.2	0.2	0.2	0.1	0.2
Total emissions	86.5	207.8	245.0	245.0	245.0	244.9	244.9	244.9

PM_{10}	Pre-merger	Post-merger w/o further mitigation	Increased train speed	Pawnee separation	Pawnee and Central separations	Pawnee, Central, and 13th separations	Pawnee, Central, 13th, and 21st separation	Elevated trainway
Locomotive emissions	2.0	4.9	5.8	5.8	244.7	244.7	244.7	244.7
Idling vehicle emissions	0.01	0.02	0.00	0.00	0.2	0.2	0.1	0.2
Total emissions	2.0	4.9	5.8	5.8	5.8	5.8	5.8	5.8

CO	Pre-merger	Post-merger w/o further mitigation	Increased train speed	Pawnee separation	Pawnee and Central separations	Pawnee, Central, and 13th separations	Pawnee, Central, 13th, and 21st separation	Elevated trainway
Locomotive emissions	10.9	26.2	31.1	31.1	31.1	31.1	31.1	31.1
Idling vehicle emissions	12.1	40.9	11.2	9.1	7.8	6.7	5.7	6.7
Total emissions	23.1	67.2	42.3	40.1	38.9	37.8	36.8	37.8

Table 4.1 Total emissions in Sedgwick County related to UP through trains on OKT line: mitigation options analysis (tons per year) (Continued)

Source and notes:

1. Calculations considered only UP through trains on OKT line.
2. Number of trains per day (for calculating locomotive emissions): 4.0 pre-merger, 9.6 post-merger, based on UP revised OKT operating plan estimates for Central Wichita.
3. Locomotive emission factors (lb/gal) are from *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, 1992, EPA. The proposed EPA locomotive emissions standards will not significantly affect locomotive emission rates in 2000. Hydrocarbon emission rates are converted to VOCs by multiplying by 1.005.
4. Locomotive fuel consumption (gal/train) is a weighted average based on the relative frequency of various train types, as specified in the UP revised OKT operating plan.
5. On-road vehicle emission rates are based on EPA MOBILE5a model runs for idling conditions (2.5 mph as specified by EPA). Runs for January 2000 and July 2000 were averaged to estimate the average daily emissions for the entire year.
6. Estimates of total hours of delay for queuing automobiles were calculated by the study team.
7. Numbers may not sum precisely due to rounding.

Table 4.2 Total CO emissions in Wichita former CO nonattainment area related to UP through trains on OKT line: mitigation options analysis (tons per year)

	Pre-merger	Post-merger w/o further mitigation	Increased train speed	Pawnee separation	Pawnee and Central separations	Pawnee, Central, and 13th separations	Pawnee, Central, 13th, and 21st separation	Elevated trainway
Locomotive emissions	0.7	1.7	2.0	2.0	2.0	2.0	2.0	2.0
Idling vehicle emissions	3.9	13.3	3.3	3.3	2.0	0.0	0.9	0.0
Total emissions	4.6	15.0	5.3	5.3	4.0	2.9	2.9	2.0

Source and notes:

1. Calculations considered only UP through trains on OKT line.
2. Number of trains per day (for calculating locomotive emissions): 4.0 pre-merger, 9.6 post-merger, based on UP revised OKT operating plan estimates for Central Wichita.
3. Locomotive emission factors (lb/gal) are from *Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources*, 1992, EPA. The proposed EPA locomotive emissions standards will not significantly affect locomotive emission rates in 2000. Hydrocarbon emission rates are converted to VOCs by multiplying by 1.005.
4. Locomotive fuel consumption (gal/train) is a weighted average based on the relative frequency of various train types, as specified in the UP revised OKT operating plan.
5. On-road vehicle emission rates are based on EPA MOBILE5a model runs for idling conditions (2.5 mph as specified by EPA). Runs for January 2000 and July 2000 were averaged to estimate the average daily emissions for the entire year.
6. Estimates of total hours of delay for queuing automobiles were calculated by the study team.
7. Numbers may not sum precisely due to rounding.

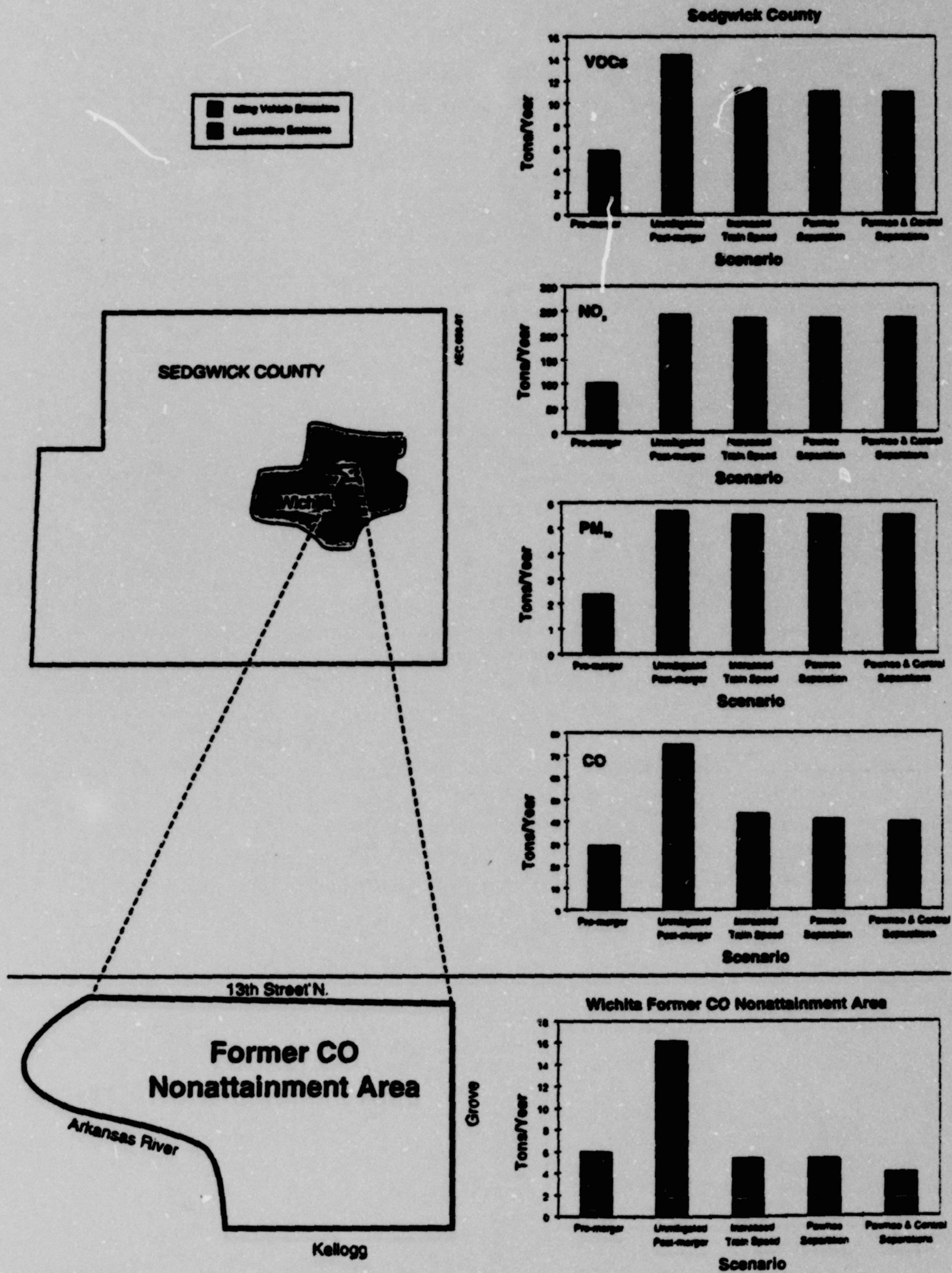

Figure 4-1. Results of emissions analysis

Table 4.3 Estimated worst-case CO concentrations at selected OKT line grade crossings in Wichita: mitigation options analysis (ppm, 8-hour average)

	Pre-merger	Post-merger w/o further mitigation	Increased train speed	Pawnee separation	Pawnee and Central separations	Pawnee, Central, and 13th separations	Pawnee, Central, 13th, and 21st separation	Elevated trainway
Locomotive emissions	7.3	7.8	7.3	7.3	7.3	6.4	6.4	6.4
Idling vehicle emissions	7.5	8.1	7.5	7.5	6.4	6.4	6.4	6.4
Total emissions	7.7	8.2	7.7	6.4	6.4	6.4	6.4	7.7

Sources and notes:

1. NAAQS for CO is 9 ppm (8-hour average).
2. Results are based on screening-level dispersion modeling using the CAL3QHC model.
3. Assumptions for worst-case analysis include:
   - All trains (4.0 pre-merger and 9.6 post-merger) pass grade crossing within an 8-hour period.
   - All trains have the length of the longest observed through train (7,883 ft on October 26, 1996).
   - Year 2000 traffic volumes for 4 p.m. to midnight used, although recent CO peaks have occurred in early morning.
   - Worst-case meteorology used: stagnant air, January temperatures.
   - Second highest 1996 8-hour average from CO monitor at Topeka and Lewis used as background CO level: 6.4 ppm, which occurred from 8 p.m. to 4 a.m. on February 8-9, 1996.
   - "Double-counting" of localized vehicle contribution to background CO level not corrected for.

These results indicate that increasing the train speed fully mitigates the projected increase in worst-case CO concentrations at the intersections studied. Because the train speed increase completely mitigates the increase in *emissions* of CO (as discussed in Section 4.1 of this appendix), it is logical that the speed increase also mitigates any increase in peak CO *concentrations* near the grade crossings. Intersections that are grade-separated as part of a mitigation option are assumed to revert to the peak background CO level of 6.4 ppm because of the elimination of queuing-related emissions.

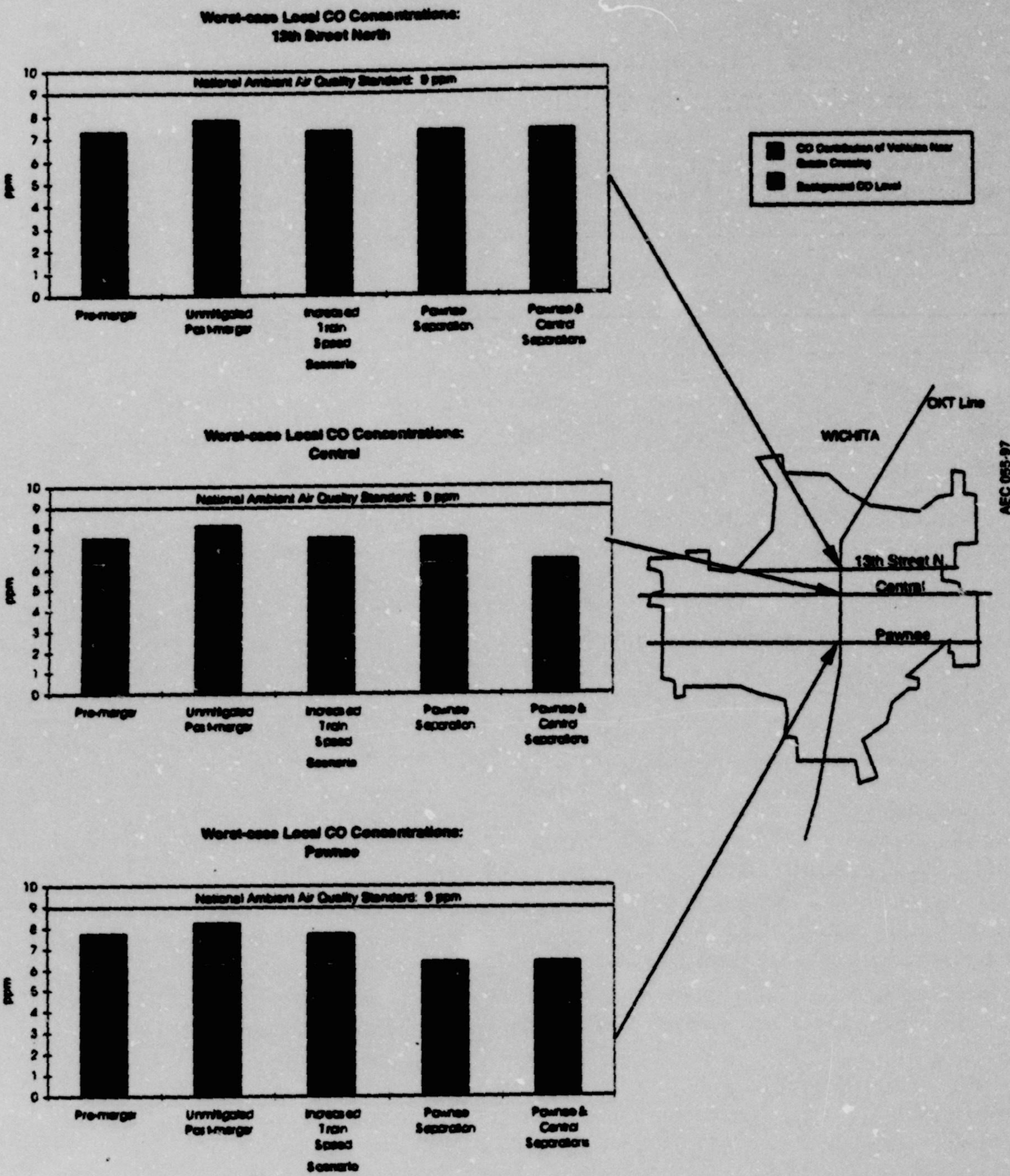

Figure 4-2. Results of localized CO dispersion modeling

Section 5
DISCUSSION OF AIR-QUALITY-SPECIFIC MITIGATION OPTIONS

As shown in Section 4 of this appendix, the general mitigation options, particularly the increase in train speed, fully mitigate the increase in merger-related on-road vehicle emissions in Sedgwick County. Therefore, no additional mitigation options specifically targeting vehicle emissions are necessary.

However, none of the three general mitigation options mitigates the increase in locomotive emissions. Although these emissions increases are small compared to total emissions from all sources in Sedgwick County, it is worth investigating mitigation options specifically aimed at reducing locomotive emissions from UP through trains, especially because Sedgwick County may fall into nonattainment for $PM_{2.5}$ under the proposed new ambient standards discussed in Section 1 of this appendix.

The study team have identified several potential options for mitigating the increase in locomotive emissions. These options, which focus on reducing NO_x and PM emissions, include the following:

- Adopting improved railroad operating practices.
- Implementing the proposed EPA locomotive emissions standards.
- Concentrating the operation of new EPA-certified low-emission locomotives in Wichita.
- Introducing low-emission locomotives in advance of the EPA schedule.
- Offsetting the increase in locomotive emissions by decreasing emissions from other sources.

Railroad operating practices are briefly discussed in Section 5.1 below. Section 5.2 discusses the implications of the proposed EPA locomotive emissions standards, and Section 5.3 addresses the potential for concentrating EPA-certified locomotives in Wichita. Section 5.4 discusses the potential of early introduction of low-emission locomotives ahead of the EPA-proposed schedule. Section 5.5 briefly discusses the potential for offsetting the locomotive emissions increase rather than mitigating it directly. Section 5.6 summarizes the findings regarding these mitigation options.

Where possible, the discussions note the potential emissions implications associated with these mitigation options. In general, however, it is difficult to quantify rigorously the extent and timing of emissions mitigation that would result from these strategies.

5.1 IMPLEMENTATION OF UP OPERATING PRACTICES

As part of the August 1996 approval of the merger, the Surface Transportation Board (Board) required UP/SP to comply with the following list of improved operating practices:

- Use throttle modulation.
- Use dynamic braking.
- Increase use of pacing and coasting trains.
- Isolate unneeded horsepower.
- Shut down locomotives when not in use for more than an hour at temperatures above 40°F.
- Maintain and upgrade SP locomotives to UP standards.
- Close boxcar doors to decrease wind resistance.
- Convert locomotives to South Coast Air Quality Management District (SCAQMD) standards for visible smoke reduction.

Although unquantifiable, the combination of these practices may reduce emissions from locomotives traveling through Sedgwick County by improving operating efficiency. With the exception of the last practice, emission reduction based on these procedures is not likely to be dramatic and may already be in effect. Converting UP/SP locomotives to the SCAQMD standards may have a significant effect if those locomotives that currently fail to meet the standard are used on the OKT line. Such retrofits would reduce PM emissions from the locomotives.

5.2 IMPLEMENTING THE PROPOSED EPA LOCOMOTIVE EMISSION STANDARDS

Emissions from locomotives are currently unregulated. In December 1996, the EPA issued a Notice of Proposed Rulemaking entitled, "Control of Air Pollution from New Locomotives and New Engines used in Locomotives." The EPA is proposing emission standards and emission testing procedures for locomotives that are similar in some respects to the emission standards for heavy-duty on-highway truck engines. Locomotive engines would have to meet brake-specific emission limits for HC, CO, NO_x, PM and exhaust opacity (visible smoke). Each engine would have to meet emission standards for both a line haul duty cycle and a switching duty cycle. (The line haul duty cycle emphasizes operation at high loads, while the switching cycle emphasizes idling and low loads.)

The proposed emission standards would begin taking effect in January 2000. Recognizing the long life and low fleet turnover rate of locomotives, the regulations would subject locomotives originally manufactured during the period of 1973-1999 to emission standards at the time of remanufacture. Railroad companies usually remanufacture their locomotives at 5- to 6-year intervals. Remanufacturing entails complete disassembly of the locomotive and its major components. Parts are then cleaned, inspected and repaired or replaced as necessary. The Class I railroads usually upgrade locomotive engines to the latest available configuration during remanufacturing. Locomotive engine manufacturers facilitate this practice by making upgraded components such as turbochargers, power assemblies and fuel injectors readily retrofittable to older engines. The EPA envisions that the proposed emission standards will provide an incentive to engine manufacturers to develop and certify suitable rebuild packages for most of their 1973-1999 locomotive models.

The locomotive emission standards proposed by the EPA are shown in Table 5-1 below. Three tiers of standards are proposed, depending on the locomotive's original date of manufacture. Tier 0 standards would be applicable at the time of remanufacturing of units originally manufactured during 1973-1999. Tier I standards would apply to units originally manufactured during 2000-2004; Tier II standards would apply to units manufactured during 2005 and thereafter. The Tier I and Tier II standards would be enforceable at the time of the locomotive's original manufacture, and during each subsequent remanufacture.

An estimate of the effect of the proposed locomotive emission standards is shown in Table 5-2. NO_x and PM emission rates from the current locomotive fleet are EPA estimates An estimate of the effect of the proposed locomotive emission standards is shown in Table (Reference 17). Remanufacturing all pre-2000 model locomotives to meet the Tier 0 standard will yield a NO_x reduction of approximately 30 percent. Assuming that a line haul locomotive is remanufactured once every five years, one-fifth, or 20 percent, of the pre-2000 model fleet would be remanufactured per year. At the end of the year 2000, 20 percent of the pre-2000 fleet would be remanufactured to Tier 0; at the end of 2001, 40 percent would be so remanufactured; conversion to Tier 0 would be complete by the end of 2005. If a railroad replaced all of its older locomotives with new units during 2000-2005, (rather than remanufacturing them), then baseline locomotives would be entirely replaced by new units meeting Tier 1. This would result in a 45-percent NO_x reduction. In practice, railroads employ a mixture of locomotive replacement and remanufacturing. (Locomotives are normally replaced after 25-30 years of service.) Therefore actual NO_x reductions by a railroad will be between 30 and 45 percent by the end of 2005.

The proposed Tier 0 and Tier I standards allow PM rates to increase from baseline, in order to accommodate NO_x control techniques that also tend to increase PM. Tier 0 allows PM to increase as much as 76 percent, compared to baseline, and Tier 1 allows PM to increase 32 percent. The actual PM increase will vary by locomotive model, and by the specific NO_x reduction techniques used.

The EPA consulted extensively with the locomotive manufacturers and the railroad industry while developing the proposed locomotive emission standards. The industry considers the standards to be technically and economically feasible (Reference 18). Attachment D of this appendix contains a review of applicable emission control techniques. The standards appear likely be adopted with little or no modification.

Table 5-1. Proposed EPA locomotive emission standards (g/bhp-hr)

Tier 0 Standards

	THC	CO	NO_x	PM
Line Haul Cycle	1.00	5.0	9.5	0.60
Switch Cycle	2.10	8.0	14.0	0.72
Max. in Run 4-8	none	none	11.9	0.75

Applicable to locomotives originally manufactured between January 1973 and December 1999. Would become effective in January 2000, and would be enforceable during remanufacturing.

Tier I Standards

	THC	CO	NO_x	PM
Line Haul Cycle	0.55	2.2	7.4	0.45
Switch Cycle	1.20	2.5	11.0	0.72
Max. in Run 4-8	none	none	9.3	0.57

Applicable to locomotives originally manufactured between January 2000 and December 2004. Would become effective in January 2000, and would be enforceable at the time of original manufacture and during remanufacturing.

Tier II Standards

	THC	CO	NO_x	PM
Line Haul Cycle	0.30	1.5	5.5	0.20
Switch Cycle	0.60	2.4	8.1	0.24
Max. in Run 4-8	none	none	6.9	0.25

Applicable to locomotives originally manufactured on or after January 1, 2005. Would become effective in January 2000, and would be enforceable at the time of original manufacture and during remanufacturing.

Table 5-2. Effect of proposed EPA emission standards on locomotive emission rates

Fleet	Line Haul NO_x Rate		Line Haul PM Rate	
	Absolute (g/bhp-hr)	Relative to Baseline	Absolute (g/bhp-hr)	Relative to Baseline
Current Baseline	13.5	100%	0.34	100%
Tier 0 Standard	9.5	70%	0.60	176%
Tier I Standard	7.4	55%	0.45	132%
Tier II Standard	5.5	41%	0.20	59%

5.3 CONCENTRATING THE OPERATION OF NEW EPA-CERTIFIED LOW-EMISSION LOCOMOTIVES IN WICHITA

Implementing the EPA's locomotive emission standards as proposed will result in locomotive fleet NO_x reductions between 30 and 45 percent, over the period of 2000-2005. The analysis presented in the previous section indicates that a minimum of five years is needed to completely remanufacture existing locomotives to meet the Tier 0 standards. Because locomotives have long service lives, replacing existing units with new emission controlled models will take much longer. Even with the accelerated process of locomotive replacement currently being conducted by the Class I railroads (because of the huge productivity improvements realized by modern high horsepower locomotives with AC traction), replacing the existing fleet with new units certified to the Tier I or Tier II standards will take 20 years or more.

As part of its approval of the merger, the Board mandated that the merged railroad concentrate low-emission locomotives meeting the proposed EPA standards in several corridors. In addition, Union Pacific and Burlington Northern Santa Fe have recently agreed with the State of California to concentrate the operation of locomotives certified to Tier I or Tier II in Southern California. This will yield much more rapid locomotive emission reductions in Southern California, than would occur with random dispatching of the new emission controlled units. A similar arrangement could be made to concentrate the operation of emission controlled locomotives on lines through Wichita, as a means of mitigating merger-related increases in locomotive emissions. This arrangement would apply both to existing locomotives remanufactured to meet Tier 0, and new locomotives meeting Tier I or Tier II. We are unable at this time to quantify the potential emissions impact of this mitigation strategy.

5.4 EARLY INTRODUCTION OF LOW-EMISSION LOCOMOTIVES

A variety of emission control techniques have been applied to locomotives in research, development, and demonstration programs conducted over the last decade. These include the following:

1. Diesel engine modifications.
2. Improved diesel fuels.
3. Diesel exhaust aftertreatment.
4. Use of alternative fuels.

Some, or all of these techniques could, in principle, be applied to UP and SP locomotives operating through Wichita, prior to the proposed EPA locomotive emission standards taking effect. This could produce emission reductions well before January 2000, when the locomotive emission standards are proposed to begin phasing in. After January 2000, they could also be applied to achieve emission reductions beyond those resulting from the emission standards alone. Attachment D of this appendix provides a review of the feasibility of the early introduction of these locomotive emission control techniques.

5.5 OFFSETTING THE INCREASE IN LOCOMOTIVE EMISSIONS BY DECREASING EMISSIONS FROM OTHER SOURCES

An alternative to mitigating the increase in locomotive emissions by reducing those emissions directly is to reduce an equivalent amount of emissions from some other source in Sedgwick County, thereby "offsetting" the locomotive emissions increase. An arrangement to accomplish this objective could take several forms. For example, UP could put money into a Countywide fund that was then used to provide incentives for reducing emissions (by replacing old wood stoves, for example, or by retrofitting trucks or agricultural equipment to reduce NO_x emissions). Or, UP could reduce emissions elsewhere in its operation in Sedgwick County.

It is important to note, however, that this type of mitigation technique is likely to be outside of the Board's authority to mandate as part of a mitigation package. However, an emissions offset strategy could be part of a private settlement between UP and the City of Wichita, outside of the Board mitigation study.

5.6 SUMMARY OF AIR-QUALITY-SPECIFIC MITIGATION OPTIONS

A variety of options exist for mitigating the increase in merger-related locomotive emissions. Two of these options—modifying operating practices and complying with the proposed EPA locomotive emissions standards (discussed in Sections 5.1 and 5.2, respectively)—have already been required by the Board and will be implemented (assuming the EPA emissions standards are approved, as appears likely). The EPA standards will substantially reduce emissions of NO_x (by 30 to 45 percent by 2005), although almost all of this reduction will occur after the baseline analysis year (2000) used in this mitigation study. The EPA standard will not reduce locomotive PM emissions in the near term.

A third option, concentrating the EPA-certified low-emission locomotives in Wichita (discussed in Section 5.3) is difficult to assess at this time, but it might provide some additional mitigation of locomotive emissions.

Early introduction of low-emission locomotives (discussed in Section 5.4 and Appendix D) could further mitigate locomotive emissions by speeding up the realization of emissions reductions from the proposed EPA locomotive standards. Given the wide area over which UP locomotives operate, this would essentially be a regional solution to a local mitigation objective in Wichita.

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Attachment A
MOBILE5a/PART5 DESCRIPTION AND INPUT/OUTPUT FILES

MOBILE5a and PART5 are models developed by the EPA to estimate vehicular emissions. MOBILE5a models VOCs, CO, and NO_x, while PART5 models PM. This attachment contains the input and output files used for both models.

For MOBILE5a runs, the study team averaged the values of winter and summer runs for the year 2000. For VOCs, note that only exhaust and running emissions are included here. Refueling, evaporative, and resting losses are not included in the calculation.

```
1         PROMPT
Wichita Summer Year 2000
1         TAMFLG
1         SPDFLG
1         VMFLAG
1         MYMRFG
1         NEWFLG
1         IMFLAG
1         ALHFLG
1         ATPFLG
5         RLFLAG
2         LOCFLG
2         TEMFLG
4         OUTFMT
4         PRTFLG
1         IDLFLG
3         MMHFLG
2         HCFLAG
Wichita2000Sum.  8  48.  93.  11.5 07.8 92 1 1 1        Local Area Parameter record
1 00 02.5 70.0 20.6 27.3 20.6 07                        Scenario description record
```

```
1           PROMPT
Wichita Winter Year 2000
1           TAMFLG
1           SPDFLG
1           VMFLAG
1           MYMRFG
1           NEWFLG
1           IMFLAG
1           ALHFLG
1           ATPFLG
5           RLFLAG
2           LOCFLG
2           TEMFLG
4           OUTFMT
4           PRTFLG
1           IDLFLG
3           NMHFLG
2           HCFLAG
Wichita2000Win.  8  20.  40. 11.5 09.0 92 1 1 1        Local Area Parameter record
1 00 02.5 30.0 20.6 27.3 20.6 01                       Scenario description record
```

```
1Wichita Summer Year 2000
 MOBILE5a (26-Mar-93)
0
-M 98 Warning:
+             Diurnal temperature rise (max temp-min temp= 45.0)
              is > 40F; diurnal evaporative emission factors will
              be calculated, but may be inaccurate.
0Wichita2000Sum.
                   Minimum Temp: 48. (F)   Maximum Temp: 93. (F)
                   Period 1 RVP: 11.5      Period 2 RVP:  7.8 Period 2 Yr: 1992
0VOC HC emission factors include evaporative HC emission factors.
0
0Emission factors are as of July 1st of the indicated calendar year.
0Cal. Year: 2000          Region: Low           Altitude:  500. Ft.
                   I/M Program: No          Ambient Temp:   70.0 / 70.0 / 70.0 F
              Anti-tam. Program: No        Operating Mode:   20.6 / 27.3 / 20.6
               Reformulated Gas: No
```

0Veh. Type:	LDGV	LDGT1	LDGT2	LDGT	HDGV	LDDV	LDDT	HDDV	MC	All Veh
Veh. Spd.:	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5	
VMT Mix:	0.614	0.191	0.086		0.031	0.001	0.001	0.068	0.006	
0Composite Emission Factors (Gm/Mile)										
VOC HC:	10.90	13.16	18.86	14.93	18.52	1.37	1.81	4.81	12.39	11.82
Exhst HC:	7.56	9.49	14.06	10.91	11.39	1.37	1.81	4.81	10.01	8.42
Evap. HC:	0.22	0.27	0.31	0.29	0.97				2.08	0.26
Refuel HC:	0.00	0.00	0.00	0.00	0.00					0.00
Runing HC:	3.08	3.35	4.45	3.69	6.10					3.11
Rsting HC:	0.04	0.04	0.04	0.04	0.07				0.30	0.04
Exhst CO:	100.94	120.58	177.08	138.10	177.55	5.02	5.52	36.82	155.95	109.31
Exhst NOX:	2.18	2.53	3.43	2.81	4.13	2.31	2.54	17.92	0.97	3.49

STB FD-32760 ID-181986 9-15-97 K 6/9

```
1Wichita Winter Year 2000
 MOBILE5a (26-Mar-93)
0
-M 83 Comment:
+              One or more evaporative temperatures (input daily
               maximum, input ambient, calculated hot soak, and/or
               calculated running loss) is 40F or less, or input
               daily minimum is 25F or less; no evaporative emission
               factors (hot soak, diurnal, running loss, or resting
               loss) will be calculated.
0Wichita2000Win.
                    Minimum Temp: 20. (F)   Maximum Temp: 40. (F)
                    Period 1 RVP: 11.5      Period 2 RVP:  9.0 Period 2 Yr: 1992
0VOC HC emission factors include evaporative HC emission factors.
0_______________________________________________________________________________
0Emission factors are as of Jan. 1st of the indicated calendar year.
0Cal. Year: 2000            Region: Low            Altitude:  500. Ft.
                      I/M Program: No         Ambient Temp:   30.0 / 30.0 / 30.0 F
                 Anti-tam. Program: No       Operating Mode:   20.6 / 27.3 / 20.6
                  Reformulated Gas: No
0Veh. Type:  LDGV  LDGT1  LDGT2   LDGT    HDGV   LDDV   LDDT   HDDV    MC  All Veh
+           _____  _____  _____  _____   _____  _____  _____  _____  _____  _____
 Veh. Spd.:  2.5    2.5    2.5            2.5    2.5    2.5    2.5    2.5
   VMT Mix:  0.616  0.191  0.086          0.031  0.002  0.001  0.068  0.006
0Composite Emission Factors (Gm/Mile)
 VOC    HC: 14.22  18.56  26.49  21.03   16.11   1.41   1.89   4.84  13.90  15.49
 Exhst  HC: 14.21  18.55  26.48  21.02   16.09   1.41   1.89   4.84  13.90  15.48
 Evap.  HC:  0.01   0.01   0.01   0.01    0.02                        0.00   0.01
 Refuel HC:  0.00   0.00   0.00   0.00    0.00                               0.00
 Runing HC:  0.00   0.00   0.00   0.00    0.00                               0.00
 Rsting HC:  0.00   0.00   0.00   0.00    0.00                        0.00   0.00
 Exhst  CO:177.58 216.37 305.10 243.93  226.31   5.10   5.63  36.96 234.46 187.80
 Exhst NOX:  2.84   3.33   4.49   3.69    4.55   2.37   2.62  18.57   1.18   4.18
 _______________________________________________________________________________
```

```
Wichita Year 2000 PART5 Input
1     :VMFLAG (alternate VMT mixes)
1     :MYMRFG (alternate mileage accumulation rates & registration)
1     :IMFLAG (inspection and maintenance)
1     :RFGFLG (2 to apply reformulated gasoline effects, 1 not to)
3     :OUTFMT (indicates type of output format)
2     :IDLFLG (2 to print idle emissions, 1 not to print them)
1     :SO2FLG (2 to print Gaseous SO2 emissions, 1 not to print them)
3     :PRTFLG (determines which pollutants to print out)
1     :BUSFLG (determines which alternative bus cycles to print out)
1 2000 2  2.5    : region, year, speed cycle, speed
04.3 05.1   2    : unpaved silt%, ind. silt g/m^2, WHEELFLG
140              : number of precip. days
Wich2000         : scene name
10.              : Particle size cutoff
6000             : fleet average vehicle weight
04               : fleet average vehicle wheels
```

PART5 Revised 02-24-95
Wichita Year 2000 PART5 Output

Wich2000 : scene name
Particle Size Cutoff 10.00 Microns   Altitude: 500. Ft.   Driving: Cruise RFG:No
Cal. Year: 2000   I/M Program: No   Region: Low

Veh. Type:	LDGV	LDGT1	LDGT2	HDGV	MC	LDDV	LDDT	2BHDDV	LHDDV	MHDDV	HHDDV	BUSES	All Veh.
Veh. Speeds:	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
VMT Mix:	0.6143	0.1900	0.0856	0.0310	0.0063	0.0015	0.0012	0.0130	0.0013	0.0166	0.0360	0.0031	
Composite Emission Factors (g/mi)													
Exhaust PM:	0.013	0.016	0.022	0.102	0.020	0.190	0.213	0.172	0.845	0.646	0.739	0.617	0.059
Brake:	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Tire:	0.008	0.008	0.008	0.012	0.004	0.008	0.008	0.008	0.012	0.012	0.036	0.008	0.009
Total PM:	0.056	0.066	0.073	0.180	0.046	0.241	0.271	0.254	0.935	0.791	0.932	0.778	0.113

Fugitive Dust: Unpaved Roads Fleet Average 17.73 g/mi (as calculated in AP42 Vol 1 9/88)*
Paved Roads Fleet Average 13.41 g/mi (as calculated in draft AP42 Vol 1 3/93)*
Unpaved Roads Fleet Average 17.53 g/mi (as calculated in AP42 Vol 1 9/88, minus tailpipe and tire-wear emissions)**
Paved Roads Fleet Average 13.21 g/mi (as calculated in draft AP42 Vol 1 3/93, minus tailpipe and tire-wear emissions)**

* Includes fleet average tailpipe, tire-wear and brake-wear emissions.
** Includes fleet average brake-wear emissions.

Paved Road Silt: 5.10 (g/m^2)
Unpaved Silt: 4.3%
Precipitation Days: 140 >0.01 in. (per year)

Fleet average vehicle weight: 6000
Fleet average number of wheels: 4

Veh. Type:	LDGV	LDGT1	LDGT2	HDGV	MC	LDDV	LDDT	2BHDDV	LHDDV	MHDDV	HHDDV	BUSES	All Veh.
Total Idle (g/hr) :	*	*	*	*	*	*	*	1.731	5.307	2.312	2.112	2.113	*

* Missing Data

Attachment B
CAL3QHC INPUT/OUTPUT FILES

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: CO WICHITA KANSAS - RAILROAD 13th St.   RUN: 13th St ST. AND RAILROAD PREMERGER

DATE : 6/18/97
TIME : 17:21:45

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S   VD = .0 CM/S   Z0 = 175. CM
U = 1.0 M/S   CLAS = 4 (D)   ATIM = 60. MINUTES   MIXH = 1000. M   AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. 13th St EB Appr.	-1000.0	-11.0	.0	-11.0	1000.	90.	AG	387.	21.6	.0	42.0		
2. 13th St.EB Queue	-30.0	-11.0	-536.6	-11.1	507.	270.	AG	168.	100.0	.0	22.0	.13	25.7
3. 13th St.EB Dep.	.0	-11.0	1000.0	-11.0	1000.	90.	AG	387.	21.6	.0	42.0		
4. 13th St.WB Appr.	1000.0	11.0	.0	11.0	1000.	270.	AG	376.	21.6	.0	42.0		
5. 13th St.WB Queue	20.0	11.0	513.4	11.1	493.	90.	AG	168.	100.0	.0	22.0	.12	25.1
6. 13th St.WB Dep.	.0	11.0	-1000.0	11.0	1000.	270.	AG	376.	21.6	.0	42.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: CO WICHITA KANSAS - RAILROAD 13th St. RUN: 13th St ST. AND RAILROAD PREMERGER

DATE : 6/18/97
TIME : 17:21:45

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 13th St.EB Queue	7200	480	3.0	387	1620	469.50	1	3
5. 13th St.WB Queue	7200	480	3.0	376	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

JOB: CO WICHITA KANSAS - RAILROAD 13th St. RUN: 13th St ST. AND RAILROAD PREMERGER

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	.8	.8	.0	.0	.0	.8	.6	.6	.9	.0	.0	.0
10.	.8	.7	.0	.0	.0	.8	.6	.4	.9	.0	.0	.0
20.	.8	.5	.0	.0	.0	.8	.6	.4	.8	.0	.0	.0
30.	.8	.5	.0	.0	.0	.8	.7	.6	.8	.0	.0	.0
40.	.8	.6	.0	.0	.0	.8	.7	.5	.9	.0	.0	.0
50.	.9	.8	.0	.0	.0	.9	.8	.6	.9	.0	.0	.0
60.	1.0	.9	.0	.0	.0	1.0	.8	.8	.9	.0	.0	.0
70.	1.1	1.1	.2	.2	.2	1.1	.8	.8	.9	.1	.0	.0
80.	1.0	.9	.5	.5	.5	1.0	.8	.8	1.0	.5	.2	.2
90.	.8	.8	1.0	1.0	1.0	.8	.4	.4	.8	.9	.6	.5
100.	.4	.4	1.2	1.3	1.3	.4	.1	.1	.4	1.1	.9	.9
110.	.1	.1	1.0	1.3	1.3	.1	.0	.0	.0	.9	.9	.9
120.	.0	.0	.8	1.2	1.2	.0	.0	.0	.0	.7	.8	.9
130.	.0	.0	.7	1.0	1.0	.0	.0	.0	.0	.7	.6	.8
140.	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.6	.5	.8
150.	.0	.0	.4	1.0	1.0	.0	.0	.0	.0	.5	.5	.7
160.	.0	.0	.5	.9	.9	.0	.0	.0	.0	.6	.3	.7
170.	.0	.0	.6	.9	.8	.0	.0	.0	.0	.6	.4	.7
180.	.0	.0	.7	.9	.9	.0	.0	.0	.0	.8	.6	.7
190.	.0	.0	.8	.9	.8	.0	.0	.0	.0	.7	.6	.5
200.	.0	.0	.7	.7	.8	.0	.0	.0	.0	.7	.6	.5
210.	.0	.0	.8	.7	.8	.0	.0	.0	.0	.8	.7	.6
220.	.0	.0	.8	.8	.9	.0	.0	.0	.0	.8	.7	.6
230.	.0	.0	.9	.8	1.0	.0	.0	.0	.0	.9	.7	.6
240.	.0	.0	1.0	.9	1.0	.0	.0	.0	.0	1.0	.8	.8
250.	.1	.2	1.1	.9	1.0	.0	.0	.0	.2	1.1	.8	.8
260.	.5	.5	1.0	1.0	1.0	.5	.2	.2	.5	1.0	.8	.8
270.	1.0	1.0	.8	.8	.8	.9	.6	.6	1.0	.8	.4	.5
280.	1.0	1.3	.4	.4	.4	1.1	.9	.9	1.3	.4	.1	.1
290.	1.0	1.3	.1	.1	.0	.9	.8	.9	1.3	.1	.0	.0
300.	.8	1.2	.0	.0	.0	.7	.7	.9	1.2	.0	.0	.0
310.	.7	1.0	.0	.0	.0	.7	.5	.9	1.0	.0	.0	.0
320.	.5	1.0	.0	.0	.0	.6	.4	.8	1.0	.0	.0	.0
330.	.5	1.0	.0	.0	.0	.7	.5	.7	1.0	.0	.0	.0
340.	.5	.9	.0	.0	.0	.6	.4	.7	1.0	.0	.0	.0
350.	.7	.9	.0	.0	.0	.8	.4	.7	.9	.0	.0	.0
360.	.8	.8	.0	.0	.0	.8	.6	.6	.9	.0	.0	.0
MAX	1.1	1.3	1.2	1.3	1.3	1.1	.9	.9	1.3	1.1	.9	.9
DEGR.	70	280	100	110	110	70	280	280	280	100	100	100

THE HIGHEST CONCENTRATION OF 1.30 PPM OCCURRED AT RECEPTOR REC4 .

JOB: CO WICHITA KANSAS - RAILROAD 13th St.　　RUN: 13th St ST. AND RAILROAD PREMERGER

DATE : 6/18/97
TIME : 17:21:45

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 70	REC2 280	REC3 100	REC4 110	REC5 110	REC6 70	REC7 280	REC8 280	REC9 280	REC10 100	REC11 100	REC12 100
1	.0	.5	.0	.0	.0	.0	.3	.3	.5	.0	.0	.0
2	.0	.6	.0	.0	.0	.0	.4	.4	.6	.0	.0	.0
3	.4	.0	.3	.3	.3	.4	.0	.0	.0	.2	.2	.2
4	.3	.0	.3	.4	.4	.3	.0	.0	.0	.3	.3	.3
5	.4	.0	.5	.6	.6	.4	.0	.0	.0	.4	.4	.4
6	.0	.2	.1	.0	.0	.0	.2	.2	.2	.2	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: CO WICHITA KANSAS - RAILROAD 13th St. RUN: 13th St ST. AND RAILROAD POSTMERGER

DATE : 6/18/97
TIME : 17:22: 2

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. 13th St EB Appr.	-1000.0	-11.0	.0	-11.0	1000.	90.	AG	387.	21.6	.0	42.0		
2. 13th St.EB Queue	-30.0	-11.0	-536.6	-11.1	507.	270.	AG	403.	100.0	.0	22.0	.14	25.7
3. 13th St.EB Dep.	.0	-11.0	1000.0	-11.0	1000.	90.	AG	387.	21.6	.0	42.0		
4. 13th St.WB Appr.	1000.0	11.0	.0	11.0	1000.	270.	AG	376.	21.6	.0	42.0		
5. 13th St.WB Queue	20.0	11.0	513.4	11.1	493.	90.	AG	403.	100.0	.0	22.0	.14	25.1
6. 13th St.WB Dep.	.0	11.0	-1000.0	11.0	1000.	270.	AG	376.	21.6	.0	42.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: CO WICHITA KANSAS - RAILROAD 13th St.   RUN: 13th St ST. AND RAILROAD POSTMERGER

DATE : 6/18/97
TIME : 17:22: 2

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 13th St.EB Queue	3000	480	3.0	387	1620	469.50	1	3
5. 13th St.WB Queue	3000	480	3.0	376	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	[illegible]	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	[illegible]	6.0
11. REC 11 (NW MID-RR)	-35.0	[illegible]	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	1.1	1.3	.0	.0	.0	1.2	.9	.9	1.6	.0	.0	.0
10.	1.2	1.1	.0	.0	.0	1.2	1.0	.7	1.5	.0	.0	.0
20.	1.2	.8	.0	.0	.0	1.2	1.0	.6	1.3	.0	.0	.0
30.	1.3	.7	.0	.0	.0	1.2	1.0	.7	1.3	.0	.0	.0
40.	1.3	.8	.0	.0	.0	1.3	1.1	.7	1.2	.0	.0	.0
50.	1.4	1.0	.0	.0	.0	1.4	1.2	.9	1.3	.0	.0	.0
60.	1.5	1.3	.0	.0	.0	1.5	1.3	1.2	1.4	.0	.0	.0
70.	1.6	1.5	.2	.2	.2	1.6	1.3	1.2	1.5	.1	.1	.0
80.	1.5	1.4	.8	.8	.8	1.5	1.1	1.1	1.5	.7	.3	.3
90.	1.1	1.1	1.5	1.6	1.6	1.1	.6	.7	1.1	1.4	.9	.9
100.	.5	.5	1.8	2.1	2.1	.5	.2	.2	.5	1.6	1.4	1.4
110.	.1	.1	1.4	2.2	2.2	.1	.0	.0	.0	1.3	1.4	1.6
120.	.0	.0	1.1	2.0	2.0	.0	.0	.0	.0	1.0	1.1	1.5
130.	.0	.0	.8	1.8	1.8	.0	.0	.0	.0	.7	.8	1.3
140.	.0	.0	.6	1.7	1.7	.0	.0	.0	.0	.6	.6	1.3
150.	.0	.0	.5	1.6	1.6	.0	.0	.0	.0	.7	.6	1.2
160.	.0	.0	.6	1.5	1.5	.0	.0	.0	.0	.8	.4	1.2
170.	.0	.0	.8	1.6	1.5	.0	.0	.0	.0	1.0	.5	1.2
180.	.0	.0	1.0	1.5	1.6	.0	.0	.0	.0	1.2	.8	1.1
190.	.0	.0	1.1	1.4	1.4	.0	.0	.0	.0	1.1	.9	.9
200.	.0	.0	1.1	1.2	1.4	.0	.0	.0	.0	1.1	1.0	.7
210.	.0	.0	1.2	1.1	1.4	.0	.0	.0	.0	1.3	1.0	.9
220.	.0	.0	1.3	1.0	1.5	.0	.0	.0	.0	1.3	1.1	.7
230.	.0	.0	1.4	1.2	1.5	.0	.0	.0	.0	1.4	1.1	.8
240.	.0	.0	1.5	1.3	1.6	.0	.0	.0	.0	1.5	1.3	1.1
250.	.2	.2	1.7	1.4	1.6	.1	.0	.0	.2	1.7	1.3	1.2
260.	.7	.8	1.5	1.5	1.6	.7	.4	.3	.8	1.5	1.1	1.1
270.	1.5	1.6	1.1	1.1	1.1	1.4	.9	.9	1.6	1.1	.6	.7
280.	1.6	2.1	.5	.5	.5	1.6	1.4	1.5	2.1	.5	.2	.2
290.	1.4	2.2	.1	.1	.0	1.2	1.3	1.6	2.2	.1	.0	.0
300.	1.0	2.0	.0	.0	.0	.9	1.0	1.5	2.0	.0	.0	.0
310.	.8	1.8	.0	.0	.0	.8	.7	1.4	1.8	.0	.0	.0
320.	.7	1.7	.0	.0	.0	.8	.5	1.3	1.7	.0	.0	.0
330.	.6	1.6	.0	.0	.0	.9	.6	1.2	1.6	.0	.0	.0
340.	.7	1.5	.0	.0	.0	1.0	.5	1.2	1.6	.0	.0	.0
350.	1.0	1.4	.0	.0	.0	1.2	.7	1.1	1.6	.0	.0	.0
360.	1.1	1.3	.0	.0	.0	1.2	.9	.9	1.6	.0	.0	.0
MAX	1.6	2.2	1.8	2.2	2.2	1.6	1.4	1.6	2.2	1.7	1.4	1.6
DEGR.	70	290	100	110	110	280	280	290	290	250	100	110

THE HIGHEST CONCENTRATION OF 2.20 PPM OCCURRED AT RECEPTOR REC4 .

JOB: CO WICHITA KANSAS - RAILROAD 13th St.   RUN: 13th St ST. AND RAILROAD POSTMERGER

DATE : 6/18/97
TIME : 17:22: 2

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
	70	290	100	110	110	280	280	290	290	250	100	110
1	.0	.4	.0	.0	.0	.3	.3	.3	.4	.3	.0	.0
2	.0	1.5	.0	.0	.0	.9	.9	1.1	1.5	1.0	.0	.0
3	.4	.0	.3	.3	.3	.2	.0	.0	.0	.0	.2	.2
4	.3	.0	.3	.4	.4	.0	.0	.0	.0	.0	.3	.3
5	.9	.0	1.1	1.5	1.5	.0	.0	.0	.0	.0	.9	1.1
6	.0	.3	.1	.0	.0	.2	.2	.2	.3	.4	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERGER

DATE : 6/18/97
TIME : 17:22:57

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. CENTRAL EB Appr.	-1000.0	-12.0	.0	-12.0	1000.	90.	AG	421.	21.6	.0	44.0		
2. CENTRAL EB Queue	-40.0	-12.0	-579.7	-12.0	540.	270.	AG	395.	100.0	.0	24.0	.15	27.4
3. CENTRAL EB Dep.	.0	-12.0	1000.0	-12.0	1000.	90.	AG	421.	21.6	.0	44.0		
4. CENTRAL WB Appr.	1000.0	12.0	.0	12.0	1000.	270.	AG	386.	21.6	.0	44.0		
5. CENTRAL WB Queue	25.0	12.0	521.0	12.0	496.	90.	AG	395.	100.0	.0	24.0	.14	25.2
6. CENTRAL.WB Dep.	.0	12.0	-1000.0	12.0	1000.	270.	AG	386.	21.6	.0	44.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERGER

DATE : 6/18/97
TIME : 17:22:57

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. CENTRAL EB Queue	3000	470	3.0	421	1620	469.50	1	3
5. CENTRAL WB Queue	3000	470	3.0	386	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD PREMERGER

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	*	.7	.6	.0	.0	.0	.8	.6	.5	.9	.0	.0	.0
10.	*	.8	.5	.0	.0	.0	.8	.6	.4	.9	.0	.0	.0
20.	*	.8	.5	.0	.0	.0	.8	.6	.3	.8	.0	.0	.0
30.	*	.8	.5	.0	.0	.0	.8	.7	.6	.7	.0	.0	.0
40.	*	.8	.7	.0	.0	.0	.8	.8	.6	.6	.0	.0	.0
50.	*	1.0	.8	.0	.0	.0	1.0	.8	.7	.8	.0	.0	.0
60.	*	1.0	.9	.0	.0	.0	1.0	.8	.8	.9	.0	.0	.0
70.	*	1.2	1.0	.2	.2	.2	1.2	.8	.8	.9	.2	.0	.0
80.	*	1.0	1.2	.6	.5	.5	1.0	.7	.8	1.0	.6	.2	.2
90.	*	.9	.8	1.0	1.1	1.0	.8	.4	.4	.9	.9	.6	.6
100.	*	.5	.5	1.2	1.4	1.4	.5	.1	.1	.5	1.2	.9	.9
110.	*	.1	.1	1.1	1.4	1.4	.1	.0	.0	.1	.9	.8	1.0
120.	*	.0	.0	.8	1.3	1.3	.0	.0	.0	.0	.8	.7	.9
130.	*	.0	.0	.7	1.1	1.1	.0	.0	.0	.0	.6	.5	.9
140.	*	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.6	.5	.8
150.	*	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.5	.5	.8
160.	*	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.5	.4	.7
170.	*	.0	.0	.5	.9	1.0	.0	.0	.0	.0	.7	.4	.7
180.	*	.0	.0	.6	.9	1.0	.0	.0	.0	.0	.7	.5	.7
190.	*	.0	.0	.7	.9	.9	.0	.0	.0	.0	.8	.6	.6
200.	*	.0	.0	.7	.8	.8	.0	.0	.0	.0	.8	.6	.5
210.	*	.0	.0	.8	.7	.9	.0	.0	.0	.0	.8	.6	.6
220.	*	.0	.0	.8	.6	.9	.0	.0	.0	.0	.8	.7	.5
230.	*	.0	.0	.9	.8	1.0	.0	.0	.0	.0	.9	.8	.5
240.	*	.0	.0	1.1	.8	1.1	.0	.0	.0	.0	1.1	.8	.7
250.	*	.2	.2	1.1	1.1	1.0	.2	.0	.0	.2	1.1	.8	.8
260.	*	.6	.6	1.1	1.1	1.1	.6	.2	.2	.6	1.1	.8	.8
270.	*	.9	1.2	.8	.8	.8	1.0	.6	.6	1.1	.8	.4	.5
280.	*	1.3	1.3	.4	.5	.5	1.0	.9	.9	1.3	.4	.1	.2
290.	*	1.0	1.5	.1	.1	.1	.8	.8	1.0	1.5	.1	.0	.0
300.	*	.7	1.2	.0	.0	.0	.8	.7	.9	1.2	.0	.0	.0
310.	*	.6	1.1	.0	.0	.0	.6	.6	.9	1.2	.0	.0	.0
320.	*	.6	.9	.0	.0	.0	.6	.5	.9	1.0	.0	.0	.0
330.	*	.5	.9	.0	.0	.0	.6	.5	.7	1.0	.0	.0	.0
340.	*	.6	.8	.0	.0	.0	.7	.4	.7	1.0	.0	.0	.0
350.	*	.7	.7	.0	.0	.0	.8	.4	.6	.9	.0	.0	.0
360.	*	.7	.6	.0	.0	.0	.8	.6	.5	.9	.0	.0	.0
MAX	*	1.3	1.5	1.2	1.4	1.4	1.2	.9	1.0	1.5	1.2	.9	1.0
DEGR.	*	280	290	100	100	100	70	280	290	290	100	100	110

THE HIGHEST CONCENTRATION OF 1.50 PPM OCCURRED AT RECEPTOR REC2 .

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD PREMERGER

DATE : 6/18/97
TIME : 17:22:41

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 290	REC3 100	REC4 100	REC5 100	REC6 70	REC7 280	REC8 290	REC9 290	REC10 100	REC11 100	REC12 110
1	.4	.5	.0	.0	.0	.0	.3	.3	.5	.0	.0	.0
2	.4	.7	.0	.0	.0	.0	.4	.5	.7	.0	.0	.0
3	.2	.0	.3	.3	.3	.5	.0	.0	.0	.3	.2	.2
4	.0	.0	.4	.5	.5	.3	.0	.0	.0	.3	.3	.3
5	.0	.0	.4	.6	.6	.4	.0	.0	.0	.4	.4	.5
6	.3	.3	.1	.0	.0	.0	.2	.2	.3	.2	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD PREMERGER

DATE : 6/18/97
TIME : 17:22:41

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. CENTRAL EB Appr.	-1000.0	-12.0	.0	-12.0	1000.	90.	AG	421.	21.6	.0	44.0		
2. CENTRAL EB Queue	-40.0	-12.0	-579.7	-12.0	540.	270.	AG	164.	100.0	.0	24.0	.14	27.4
3. CENTRAL EB Dep.	.0	-12.0	1000.0	-12.0	1000.	90.	AG	421.	21.6	.0	44.0		
4. CENTRAL WB Appr.	1000.0	12.0	.0	12.0	1000.	270.	AG	386.	21.6	.0	44.0		
5. CENTRAL WB Queue	25.0	12.0	521.0	12.0	496.	90.	AG	164.	100.0	.0	24.0	.13	25.2
6. CENTRAL.WB Dep.	.0	12.0	-1000.0	12.0	1000.	270.	AG	386.	21.6	.0	44.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD PREMERGER

DATE : 6/18/97
TIME : 17:22:41

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. CENTRAL EB Queue	7200	470	3.0	421	1620	469.50	1	3
5. CENTRAL WB Queue	7200	470	3.0	386	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	.8	.9	.0	.0	.0	.8	.6	.6	1.0	.0	.0	.0
10.	.8	.8	.0	.0	.0	.8	.7	.5	1.0	.0	.0	.0
20.	.8	.6	.0	.0	.0	.8	.7	.4	.8	.0	.0	.0
30.	.8	.5	.0	.0	.0	.8	.7	.6	.9	.0	.0	.0
40.	.9	.6	.0	.0	.0	.9	.7	.5	.9	.0	.0	.0
50.	.9	.8	.0	.0	.0	.9	.8	.6	.9	.0	.0	.0
60.	1.0	.9	.0	.0	.0	1.0	.8	.8	.9	.0	.0	.0
70.	1.0	1.0	.1	.1	.1	1.0	.7	.8	1.0	.0	.0	.0
80.	.9	.9	.5	.4	.4	.9	.6	.7	1.0	.4	.2	.1
90.	.7	.7	.9	.9	.9	.7	.4	.4	.8	.9	.5	.5
100.	.3	.3	1.1	1.2	1.2	.3	.1	.1	.3	1.1	.8	.8
110.	.1	.1	.9	1.3	1.3	.1	.0	.0	.0	.9	.9	.9
120.	.0	.0	.8	1.2	1.2	.0	.0	.0	.0	.8	.8	.9
130.	.0	.0	.7	1.1	1.1	.0	.0	.0	.0	.7	.6	.8
140.	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.6	.5	.8
150.	.0	.0	.4	1.0	1.0	.0	.0	.0	.0	.5	.5	.8
160.	.0	.0	.5	.9	.9	.0	.0	.0	.0	.6	.3	.8
170.	.0	.0	.6	1.0	.9	.0	.0	.0	.0	.7	.4	.8
180.	.0	.0	.7	1.0	1.0	.0	.0	.0	.0	.8	.6	.7
190.	.0	.0	.8	.9	.9	.0	.0	.0	.0	.7	.6	.6
200.	.0	.0	.7	.8	.9	.0	.0	.0	.0	.7	.7	.5
210.	.0	.0	.8	.7	.9	.0	.0	.0	.0	.8	.7	.6
220.	.0	.0	.9	.8	.9	.0	.0	.0	.0	.9	.7	.6
230.	.0	.0	.9	.9	1.0	.0	.0	.0	.0	.9	.7	.6
240.	.0	.0	1.0	1.0	1.0	.0	.0	.0	.0	1.0	.8	.8
250.	.1	.1	1.1	.9	1.0	.0	.0	.0	.1	1.0	.8	.8
260.	.4	.5	.9	1.0	1.0	.4	.2	.2	.4	.9	.7	.7
270.	.9	1.0	.7	.8	.8	.9	.5	.5	.9	.7	.4	.4
280.	1.0	1.2	.3	.4	.4	1.0	.8	.8	1.2	.3	.1	.1
290.	1.0	1.3	.1	.1	.0	.8	.8	.9	1.3	.1	.0	.0
300.	.8	1.2	.0	.0	.0	.7	.7	.9	1.2	.0	.0	.0
310.	.7	1.1	.0	.0	.0	.7	.5	.9	1.1	.0	.0	.0
320.	.5	1.0	.0	.0	.0	.6	.5	.8	1.0	.0	.0	.0
330.	.5	1.0	.0	.0	.0	.7	.5	.8	1.0	.0	.0	.0
340.	.6	1.0	.0	.0	.0	.7	.4	.8	1.0	.0	.0	.0
350.	.7	.9	.0	.0	.0	.8	.5	.7	1.0	.0	.0	.0
360.	.8	.9	.0	.0	.0	.8	.6	.6	1.0	.0	.0	.0
MAX	1.0	1.3	1.1	1.3	1.3	1.0	.8	.9	1.3	1.1	.9	.9
DEGR.	280	290	100	110	110	60	50	290	290	100	110	110

THE HIGHEST CONCENTRATION OF 1.30 PPM OCCURRED AT RECEPTOR REC4 .

JOB: CO WICHITA KANSAS - RAILROAD 13th St. RUN: 13th St ST. AND RR POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:22:20

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 290	REC3 100	REC4 110	REC5 110	REC6 60	REC7 50	REC8 290	REC9 290	REC10 100	REC11 110	REC12 110
1	.3	.4	.0	.0	.0	.0	.0	.3	.4	.0	.0	.0
2	.4	.6	.0	.0	.0	.0	.0	.4	.6	.0	.0	.0
3	.1	.0	.3	.3	.3	.4	.3	.0	.0	.2	.2	.2
4	.0	.0	.3	.4	.4	.2	.2	.0	.0	.3	.3	.3
5	.0	.0	.4	.6	.6	.4	.3	.0	.0	.4	.4	.4
6	.2	.3	.1	.0	.0	.0	.0	.2	.3	.2	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: CO WICHITA KANSAS - RAILROAD 13th St. RUN: 13th St ST. AND RR POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:22:20

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. 13th St EB Appr.	-1000.0	-11.0	.0	-11.0	1000.	90.	AG	387.	21.6	.0	42.0		
2. 13th St.EB Queue	-30.0	-11.0	-264.3	-11.1	234.	270.	AG	186.	100.0	.0	22.0	.13	11.9
3. 13th St.EB Dep.	.0	-11.0	1000.0	-11.0	1000.	90.	AG	387.	21.6	.0	42.0		
4. 13th St.WB Appr.	1000.0	11.0	.0	11.0	1000.	270.	AG	376.	21.6	.0	42.0		
5. 13th St.WB Queue	20.0	11.0	248.2	11.1	228.	90.	AG	186.	100.0	.0	22.0	.13	11.6
6. 13th St.WB Dep.	.0	11.0	-1000.0	11.0	1000.	270.	AG	376.	21.6	.0	42.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: CO WICHITA KANSAS - RAILROAD 13th St. RUN: 13th St ST. AND RR POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:22:20

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. 13th St.EB Queue	3000	222	3.0	387	1620	469.50	1	3
5. 13th St.WB Queue	3000	222	3.0	376	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERGER

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	1.1	.8	.0	.0	.0	1.2	.8	.7	1.5	.0	.0	.0
10.	1.2	.6	.0	.0	.0	1.2	.9	.4	1.3	.0	.0	.0
20.	1.2	.5	.0	.0	.0	1.2	1.0	.3	1.1	.0	.0	.0
30.	1.2	.6	.0	.0	.0	1.2	1.0	.6	.9	.0	.0	.0
40.	1.3	.8	.0	.0	.0	1.3	1.2	.8	.9	.0	.0	.0
50.	1.4	1.0	.0	.0	.0	1.4	1.2	1.0	1.1	.0	.0	.0
60.	1.5	1.2	.0	.0	.0	1.5	1.3	1.1	1.3	.0	.0	.0
70.	1.7	1.5	.2	.3	.3	1.7	1.2	1.2	1.3	.2	.1	.1
80.	1.5	1.7	.9	.8	.8	1.5	1.1	1.1	1.5	.8	.4	.3
90.	1.2	1.1	1.5	1.7	1.7	1.1	.6	.7	1.2	1.4	.9	.9
100.	.6	.6	1.8	2.3	2.3	.6	.2	.2	.6	1.7	1.4	1.5
110.	.1	.1	1.6	2.3	2.3	.1	.0	.0	.1	1.2	1.3	1.6
120.	.0	.0	1.0	2.2	2.2	.0	.0	.0	.0	1.0	1.1	1.5
130.	.0	.0	.8	1.8	1.8	.0	.0	.0	.0	.7	.7	1.5
140.	.0	.0	.6	1.7	1.7	.0	.0	.0	.0	.6	.5	1.3
150.	.0	.0	.5	1.7	1.6	.0	.0	.0	.0	.6	.5	1.3
160.	.0	.0	.5	1.6	1.6	.0	.0	.0	.0	.6	.4	1.2
170.	.0	.0	.6	1.6	1.6	.0	.0	.0	.0	.9	.5	1.2
180.	.0	.0	.8	1.5	1.6	.0	.0	.0	.0	1.1	.6	1.1
190.	.0	.0	.9	1.3	1.6	.0	.0	.0	.0	1.2	.8	.9
200.	.0	.0	1.1	1.1	1.4	.0	.0	.0	.0	1.2	.9	.7
210.	.0	.0	1.2	.9	1.4	.0	.0	.0	.0	1.2	1.0	.8
220.	.0	.0	1.3	.9	1.5	.0	.0	.0	.0	1.3	1.1	.7
230.	.0	.0	1.3	1.1	1.5	.0	.0	.0	.0	1.3	1.2	.8
240.	.0	.0	.1.6	1.2	1.6	.0	.0	.0	.0	1.6	1.3	1.1
250.	.2	.3	1.7	1.5	1.5	.2	.1	.1	.3	1.6	1.3	1.2
260.	.8	.9	1.6	1.6	1.6	.8	.4	.4	.9	1.6	1.1	1.1
270.	1.4	1.8	1.1	1.1	1.1	1.5	.9	1.0	1.7	1.1	.6	.7
280.	1.8	2.3	.5	.6	.6	1.5	1.4	1.5	2.2	.5	.2	.2
290.	1.3	2.4	.1	.1	.1	1.1	1.2	1.6	2.4	.1	.0	.0
300.	.9	2.0	.0	.0	.0	.9	1.0	1.6	2.1	.0	.0	.0
310.	.7	1.8	.0	.0	.0	.8	.7	1.5	1.9	.0	.0	.0
320.	.6	1.6	.0	.0	.0	.7	.6	1.3	1.7	.0	.0	.0
330.	.6	1.4	.0	.0	.0	.9	.6	1.2	1.7	.0	.0	.0
340.	.7	1.2	.0	.0	.0	1.0	.5	1.0	1.6	.0	.0	.0
350.	.9	1.0	.0	.0	.0	1.1	.6	.9	1.6	.0	.0	.0
360.	1.1	.8	.0	.0	.0	1.2	.8	.7	1.5	.0	.0	.0
MAX	1.8	2.4	1.8	2.3	2.3	1.7	1.4	1.6	2.4	1.7	1.4	1.6
DEGR.	280	290	100	110	110	70	280	290	290	100	100	110

THE HIGHEST CONCENTRATION OF 2.40 PPM OCCURRED AT RECEPTOR REC2 .

DATE : 6/18/97
TIME : 17:22:57

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 290	REC3 100	REC4 110	REC5 110	REC6 70	REC7 280	REC8 290	REC9 290	REC10 10C	REC11 100	REC12 110
1	.4	.5	.0	.0	.0	.0	.3	.3	.5	.0	.0	.0
2	.9	1.6	.0	.0	.0	.0	.9	1.1	1.6	.0	.0	.0
3	.2	.0	.3	.3	.3	.5	.0	.0	.0	.3	.2	.2
4	.0	.0	.4	.4	.4	.3	.0	.0	.C	.3	.3	.3
5	.0	.0	1.0	1.6	1.6	.9	.0	.0	.0	.9	.9	1.1
6	.3	.3	.1	.0	.0	.0	.2	.2	.3	.2	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:23:14

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. CENTRAL EB Appr.	-1000.0	-12.0	.0	-12.0	1000.	90.	AG	421.	21.6	.0	44.0		
2. CENTRAL EB Queue	-40.0	-12.0	-294.9	-12.0	255.	270.	AG	186.	100.0	.0	24.0	.14	12.9
3. CENTRAL EB Dep.	.0	-12.0	1000.0	-12.0	1000.	90.	AG	421.	21.6	.0	44.0		
4. CENTRAL WB Appr.	1000.0	12.0	.0	12.0	1000.	270.	AG	386.	21.6	.0	44.0		
5. CENTRAL WB Queue	25.0	12.0	259.3	12.0	234.	90.	AG	186.	100.0	.0	24.0	.13	11.9
6. CENTRAL.WB Dep.	.0	12.0	-1000.0	12.0	1000.	270.	AG	386.	21.6	.0	44.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:23:14

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. CENTRAL EB Queue	3000	222	3.0	421	1620	469.50	1	3
5. CENTRAL WB Queue	3000	222	3.0	386	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERG INC SPEED

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	.8	.6	.0	.0	.0	.8	.6	.5	1.0	.0	.0	.0
10.	.8	.6	.0	.0	.0	.8	.7	.4	.9	.0	.0	.0
20.	.8	.5	.0	.0	.0	.8	.7	.3	.8	.0	.0	.0
30.	.9	.5	.0	.0	.0	.9	.7	.6	.7	.0	.0	.0
40.	.9	.7	.0	.0	.0	.9	.8	.6	.7	.0	.0	.0
50.	1.0	.8	.0	.0	.0	1.0	.8	.7	.8	.0	.0	.0
60.	1.0	.9	.0	.0	.0	1.0	.8	.8	.9	.0	.0	.0
70.	1.2	1.0	.1	.1	.1	1.1	.8	.8	.9	.1	.0	.0
80.	.9	1.2	.6	.5	.5	.9	.7	.7	1.0	.6	.2	.2
90.	.8	.8	.9	1.0	1.0	.7	.4	.4	.9	.9	.5	.5
100.	.4	.4	1.2	1.4	1.4	.4	.1	.1	.5	1.1	.8	.8
110.	.1	.1	1.1	1.4	1.4	.1	.0	.0	.1	.9	.8	.9
120.	.0	.0	.8	1.4	1.4	.0	.0	.0	.0	.8	.8	1.0
130.	.0	.0	.7	1.1	1.1	.0	.0	.0	.0	.7	.5	1.0
140.	.0	.0	.5	1.1	1.1	.0	.0	.0	.0	.6	.5	.8
150.	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.6	.5	.8
160.	.0	.0	.5	1.0	1.0	.0	.0	.0	.0	.5	.4	.8
170.	.0	.0	.6	1.0	1.0	.0	.0	.0	.0	.7	.5	.8
180.	.0	.0	.6	1.0	1.0	.0	.0	.0	.0	.8	.5	.7
190.	.0	.0	.7	.9	1.0	.0	.0	.0	.0	.8	.6	.6
200.	.0	.0	.8	.8	.9	.0	.0	.0	.0	.8	.6	.6
210.	.0	.0	.8	.7	.9	.0	.0	.0	.0	.9	.7	.6
220.	.0	.0	.9	.7	1.0	.0	.0	.0	.0	.9	.7	.5
230.	.0	.0	.9	.8	1.0	.0	.0	.0	.0	.9	.8	.6
240.	.0	.0	1.1	.8	1.1	.0	.0	.0	.0	1.1	.8	.7
250.	.1	.1	1.1	1.1	1.0	.1	.0	.0	.1	1.1	.8	.8
260.	.6	.6	1.1	1.1	1.1	.5	.2	.2	.6	1.1	.7	.7
270.	.9	1.1	.7	.8	.8	1.0	.5	.5	1.0	.7	.4	.4
280.	1.3	1.3	.3	.5	.5	1.0	.8	.9	1.3	.3	.1	.1
290.	1.0	1.5	.1	.1	.1	.8	.8	1.0	1.5	.1	.0	.0
300.	.7	1.3	.0	.0	.0	.8	.7	1.0	1.3	.0	.0	.0
310.	.7	1.2	.0	.0	.0	.6	.6	.9	1.2	.0	.0	.0
320.	.6	1.0	.0	.0	.0	.6	.5	.9	1.1	.0	.0	.0
330.	.6	.9	.0	.0	.0	.7	.5	.8	1.0	.0	.0	.0
340.	.6	.9	.0	.0	.0	.7	.4	.7	1.0	.0	.0	.0
350.	.7	.7	.0	.0	.0	.8	.4	.6	1.0	.0	.0	.0
360.	.8	.6	.0	.0	.0	.8	.4	.5	1.0	.0	.0	.0
MAX	1.3	1.5	1.2	1.4	1.4	1.1	.8	1.0	1.5	1.1	.8	1.0
DEGR.	280	290	100	100	100	70	40	290	290	100	120	120

THE HIGHEST CONCENTRATION OF 1.50 PPM OCCURRED AT RECEPTOR REC2 .

JOB: CO WICHITA KANSAS - RAILROAD CENTRAL RUN: CENTRAL AND RAILROAD POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:23:14

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 290	REC3 100	REC4 100	REC5 100	REC6 70	REC7 40	REC8 290	REC9 290	REC10 100	REC11 120	REC12 120
1	.4	.5	.0	.0	.0	.0	.0	.3	.5	.0	.0	.0
2	.4	.7	.0	.0	.0	.0	.0	.5	.7	.0	.0	.0
3	.2	.0	.3	.3	.3	.5	.3	.0	.0	.3	.2	.2
4	.0	.0	.4	.5	.5	.3	.2	.0	.0	.3	.2	.3
5	.0	.0	.4	.6	.6	.3	.3	.0	.0	.3	.3	.5
6	.3	.3	.1	.0	.0	.0	.0	.2	.3	.2	.1	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: WICHITA KS - RAILROAD PAWNEE St. RUN: PAWNEE ST. AND RR, PREMERGER

DATE : 6/18/97
TIME : 17:23:45

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)
1. PAWNEE EB Appr.	-1000.0	-10.0	.0	-10.0	1000.	90.	AG	585.	25.3
2. PAWNEE EB Queue	-30.0	-10.0	-729.3	-10.2	699.	270.	AG	153.	100.0
3. PAWNEE EB Dep.	.0	-10.0	1000.0	-10.0	1000.	90.	AG	585.	25.3
4. PAWNEE WB Appr.	1000.0	10.0	.0	10.0	1000.	270.	AG	670.	25.3
5. PAWNEE WB Queue	20.0	10.0	822.3	10.2	802.	90.	AG	153.	100.0
6. PAWNEE WB Dep.	.0	10.0	-1000.0	10.0	1000.	270.	AG	670.	25.3
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0

JOB: WICHITA KS - RAILROAD PAWNEE St. RUN: PAWNEE ST. AND RR, PREMERGER

DATE : 6/18/97
TIME : 17:23:45

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. PAWNEE EB Queue	7200	438	3.0	585	1620	469.50	1	3
5. PAWNEE WB Queue	7200	438	3.0	670	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	1.1	1.2	.0	.0	.0	1.2	.9	.9	1.3	.0	.0	.0
10.	1.1	1.0	.0	.0	.0	1.1	.9	.7	1.2	.0	.0	.0
20.	1.1	.9	.0	.0	.0	1.1	.9	.8	1.1	.0	.0	.0
30.	1.2	1.0	.0	.0	.0	1.2	.9	.9	1.2	.0	.0	.0
40.	1.2	1.0	.0	.0	.0	1.2	.9	.8	1.2	.0	.0	.0
50.	1.4	1.2	.0	.0	.0	1.4	1.1	1.1	1.2	.0	.0	.0
60.	1.4	1.3	.0	.0	.0	1.4	1.2	1.2	1.3	.0	.0	.0
70.	1.6	1.5	.2	.2	.2	1.6	1.2	1.2	1.6	.1	.0	.0
80.	1.6	1.6	.6	.7	.7	1.6	1.2	1.2	1.6	.7	.4	.4
90.	1.1	1.2	1.4	1.4	1.4	1.1	.8	.9	1.2	1.3	.9	.9
100.	.5	.5	1.7	1.8	1.8	.5	.3	.3	.6	1.7	1.4	1.3
110.	.1	.1	1.6	1.8	1.8	.1	.0	.0	.1	1.7	1.2	1.4
120.	.0	.0	1.4	1.6	1.6	.0	.0	.0	.0	1.3	1.0	1.2
130.	.0	.0	1.1	1.5	1.5	.0	.0	.0	.0	1.1	.9	1.1
140.	.0	.0	1.0	1.4	1.4	.0	.0	.0	.0	1.1	.9	1.0
150.	.0	.0	.9	1.3	1.2	.0	.0	.0	.0	1.0	.7	1.0
160.	.0	.0	1.0	1.2	1.2	.0	.0	.0	.0	1.0	.8	1.0
170.	.0	.0	.9	1.2	1.2	.0	.0	.0	.0	1.0	.8	1.0
180.	.0	.0	1.0	1.2	1.2	.0	.0	.0	.0	1.1	.8	1.0
190.	.0	.0	1.0	1.1	1.2	.0	.0	.0	.0	1.1	.9	.9
200.	.0	.0	1.1	1.2	1.2	.0	.0	.0	.0	1.1	.9	1.0
210.	.0	.0	1.2	1.1	1.3	.0	.0	.0	.0	1.1	.9	.8
220.	.0	.0	1.3	1.2	1.3	.0	.0	.0	.0	1.3	.9	.9
230.	.0	.0	1.3	1.2	1.3	.0	.0	.0	.0	1.3	1.1	1.0
240.	.0	.0	1.4	1.4	1.6	.0	.0	.0	.0	1.4	1.1	1.0
250.	.1	.1	1.7	1.6	1.8	.1	.0	.0	.1	1.7	1.3	1.2
260.	.6	.6	1.6	1.6	1.6	.7	.3	.3	.6	1.6	1.2	1.3
270.	1.3	1.3	1.2	1.2	1.2	1.3	.9	.8	1.3	1.2	.8	.8
280.	1.7	1.8	.6	.5	.6	1.6	1.2	1.3	1.8	.6	.4	.4
290.	1.5	1.7	.1	.1	.1	1.5	1.2	1.3	1.7	.1	.0	.0
300.	1.3	1.6	.0	.0	.0	1.1	1.1	1.3	1.6	.0	.0	.0
310.	1.1	1.6	.0	.0	.0	1.1	1.0	1.1	1.6	.0	.0	.0
320.	.9	1.3	.0	.0	.0	1.1	.7	1.0	1.3	.0	.0	.0
330.	1.0	1.3	.0	.0	.0	1.1	.8	1.0	1.3	.0	.0	.0
340.	.9	1.2	.0	.0	.0	1.0	.8	1.0	1.2	.0	.0	.0
350.	1.0	1.1	.0	.0	.0	1.1	.7	.9	1.2	.0	.0	.0
360.	1.1	1.2	.0	.0	.0	1.2	.9	.9	1.3	.0	.0	.0
MAX	1.7	1.8	1.7	1.8	1.8	1.6	1.2	1.3	1.8	1.7	1.4	1.4
DEGR.	280	280	100	100	250	70	60	280	280	100	100	110

THE HIGHEST CONCENTRATION OF 1.80 PPM OCCURRED AT RECEPTOR REC5 .

JOB: WICHITA KS - RAILROAD PAWNEE St.   RUN: PAWNEE ST. AND RR, PREMERGER

DATE : 6/18/97
TIME : 17:23:45

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 280	REC3 100	REC4 100	REC5 250	REC6 70	REC7 60	REC8 280	REC9 280	REC10 100	REC11 100	REC12 110
1	.6	.8	.0	.0	.4	.0	.0	.5	.8	.0	.0	.0
2	.4	.5	.0	.0	.3	.0	.0	.4	.5	.0	.0	.0
3	.2	.0	.4	.4	.1	.7	.5	.0	.0	.4	.4	.4
4	.0	.0	.7	.9	.4	.5	.4	.0	.0	.6	.6	.6
5	.0	.0	.4	.5	.1	.4	.3	.0	.0	.4	.4	.4
6	.5	.5	.2	.0	.5	.0	.0	.4	.5	.3	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221

JOB: WICHITA KS - RAILROAD PAWNEE St.   RUN: PAWNEE ST. AND RR, POSTMERGER

DATE : 6/18/97
TIME : 17:24: 5

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S   VD = .0 CM/S   Z0 = 175. CM
U = 1.0 M/S   CLAS = 4 (D)   ATIM = 60. MINUTES   MIXH = 1000. M   AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH
1. PAWNEE EB Appr.	-1000.0	-10.0	.0	-10.0	1000.	90.	AG	585.	25.3	.0	40.0		
2. PAWNEE EB Queue	-30.0	-10.0	-729.3	-10.2	699.	270.	AG	368.	100.0	.0	20.0	.21	35.5
3. PAWNEE EB Dep.	.0	-10.0	1000.0	-10.0	1000.	90.	AG	585.	25.3	.0	40.0		
4. PAWNEE WB Appr.	1000.0	10.0	.0	10.0	1000.	270.	AG	670.	25.3	.0	40.0		
5. PAWNEE WB Queue	20.0	10.0	822.3	10.2	802.	90.	AG	368.	100.0	.0	20.0	.24	40.8
6. PAWNEE WB Dep.	.0	10.0	-1000.0	10.0	1000.	270.	AG	670.	25.3	.0	40.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: WICHITA KS - RAILROAD PAWNEE St.   RUN: PAWNEE ST. AND RR, POSTMERGER

DATE : 6/18/97
TIME : 17:24: 5

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. PAWNEE EB Queue	*	3000	438	3.0	585	1620	469.50	1	3
5. PAWNEE WB Queue	*	3000	438	3.0	670	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. REC 1 (SE CORNER)	*	35.0	-35.0	6.0	*
2. REC 2 (SW CORNER)	*	-35.0	-35.0	6.0	*
3. REC 3 (NW CORNER)	*	-35.0	35.0	6.0	*
4. REC 4 (NE CORNER)	*	35.0	35.0	6.0	*
5. REC 5 (NE MID-13th S	*	50.0	35.0	6.0	*
6. REC 6 (SE MID-13th S	*	50.0	-35.0	6.0	*
7. REC 7 (SE MID-RR)	*	35.0	-50.0	6.0	*
8. REC 8 (SW MID-RR)	*	-35.0	-50.0	6.0	*
9. REC 9 (SW MID-13th S	*	-50.0	-35.0	6.0	*
10. REC 10 (NW MID-13th	*	-50.0	35.0	6.0	*
11. REC 11 (NW MID-RR)	*	-35.0	50.0	6.0	*
12. REC 12 (NE MID-RR)	*	35.0	50.0	6.0	*

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	1.5	1.6	.0	.0	.0	1.5	1.1	1.2	1.8	.0	.0	.0
10.	1.4	1.3	.0	.0	.0	1.5	1.2	.9	1.7	.0	.0	.0
20.	1.4	1.1	.0	.0	.0	1.4	1.2	.9	1.6	.0	.0	.0
30.	1.6	1.1	.0	.0	.0	1.6	1.3	1.0	1.6	.0	.0	.0
40.	1.6	1.2	.0	.0	.0	1.6	1.3	1.0	1.6	.0	.0	.0
50.	1.9	1.4	.0	.0	.0	1.9	1.4	1.3	1.6	.0	.0	.0
60.	1.9	1.7	.0	.0	.0	1.9	1.6	1.5	1.7	.0	.0	.0
70.	2.1	2.0	.2	.2	.2	2.1	1.6	1.6	2.1	.2	.1	.1
80.	2.1	2.1	.8	1.0	1.0	2.1	1.6	1.6	2.1	.9	.6	.6
90.	1.5	1.6	1.9	2.0	2.0	1.4	1.0	1.1	1.6	1.8	1.2	1.2
100.	.6	.6	2.3	2.6	2.6	.6	.3	.3	.7	2.2	1.9	1.8
110.	.1	.1	2.1	2.6	2.6	.1	.0	.0	.1	2.0	1.7	2.0
120.	.0	.0	1.7	2.3	2.3	.0	.0	.0	.0	1.5	1.4	1.7
130.	.0	.0	1.2	2.1	2.1	.0	.0	.0	.0	1.1	1.1	1.6
140.	.0	.0	1.1	2.0	2.0	.0	.0	.0	.0	1.1	1.0	1.5
150.	.0	.0	.9	1.9	1.8	.0	.0	.0	.0	1.1	.8	1.4
160.	.0	.0	1.0	1.7	1.7	.0	.0	.0	.0	1.2	.9	1.4
170.	.0	.0	1.1	1.7	1.7	.0	.0	.0	.0	1.3	.9	1.4
180.	.0	.0	1.2	1.7	1.7	.0	.0	.0	.0	1.4	1.0	1.3
190.	.0	.0	1.3	1.6	1.7	.0	.0	.0	.0	1.4	1.1	1.2
200.	.0	.0	1.4	1.6	1.7	.0	.0	.0	.0	1.4	1.2	1.2
210.	.0	.0	1.6	1.4	1.8	.0	.0	.0	.0	1.5	1.3	1.0
220.	.0	.0	1.7	1.4	1.9	.0	.0	.0	.0	1.7	1.3	1.1
230.	.0	.0	1.8	1.5	1.8	.0	.0	.0	.0	1.8	1.4	1.2
240.	.0	.0	1.9	1.8	2.0	.0	.0	.0	.0	1.9	1.5	1.3
250.	.2	.2	2.2	2.0	2.2	.2	.1	.1	.2	2.2	1.7	1.6
260.	.8	.8	2.1	2.1	2.1	.9	.4	.4	.8	2.1	1.5	1.6
270.	1.8	1.9	1.5	1.5	1.5	1.7	1.3	1.2	1.8	1.5	1.0	1.0
280.	2.2	2.6	.7	.6	.7	2.1	1.7	1.8	2.6	.7	.4	.4
290.	1.9	2.5	.1	.1	.1	1.9	1.6	1.9	2.5	.1	.0	.0
300.	1.5	2.3	.0	.0	.0	1.3	1.4	1.8	2.3	.0	.0	.0
310.	1.1	2.2	.0	.0	.0	1.2	1.2	1.6	2.2	.0	.0	.0
320.	1.0	1.9	.0	.0	.0	1.3	.8	1.5	1.9	.0	.0	.0
330.	1.1	1.9	.0	.0	.0	1.3	.9	1.4	1.9	.0	.0	.0
340.	1.1	1.7	.0	.0	.0	1.3	.9	1.4	1.7	.0	.0	.0
350.	1.2	1.6	.0	.0	.0	1.4	.9	1.3	1.7	.0	.0	.0
360.	1.5	1.6	.0	.0	.0	1.5	1.1	1.2	1.8	.0	.0	.0
MAX	2.2	2.6	2.3	2.6	2.6	2.1	1.7	1.9	2.6	2.2	1.9	2.0
DEGR.	280	280	100	100	100	70	280	290	280	100	100	110

THE HIGHEST CONCENTRATION OF 2.60 PPM OCCURRED AT RECEPTOR REC4 .

JOB: WICHITA KS - RAILROAD PAWNEE St.   RUN: PAWNEE ST. AND RR, POSTMERGER

DATE : 6/18/97
TIME : 17:24: 5

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 280	REC3 100	REC4 100	REC5 100	REC6 70	REC7 280	REC8 290	REC9 280	REC10 100	REC11 100	REC12 110
1	.6	.8	.0	.0	.0	.0	.5	.5	.8	.0	.0	.0
2	.9	1.3	.0	.0	.0	.0	.8	1.0	1.3	.0	.0	.0
3	.2	.0	.4	.4	.4	.7	.0	.0	.0	.4	.4	.4
4	.0	.0	.7	.9	.9	.5	.0	.0	.0	.6	.6	.6
5	.0	.0	1.0	1.3	1.3	.9	.0	.0	.0	.9	.9	1.0
6	.5	.5	.2	.0	.0	.0	.4	.4	.5	.3	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: WICHITA KS - RAILROAD PAWNEE St. RUN: PAWNEE ST. AND RR, POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:24:24

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 175. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH
1. PAWNEE EB Appr.	-1000.0	-10.0	.0	-10.0	1000.	90.	AG	585.	25.3	.0	40.0		
2. PAWNEE EB Queue	-30.0	-10.0	-384.5	-10.1	354.	270.	AG	186.	100.0	.0	20.0	.20	18.0
3. PAWNEE EB Dep.	.0	-10.0	1000.0	-10.0	1000.	90.	AG	585.	25.3	.0	40.0		
4. PAWNEE WB Appr.	1000.0	10.0	.0	10.0	1000.	270.	AG	670.	25.3	.0	40.0		
5. PAWNEE WB Queue	20.0	10.0	426.7	10.1	407.	90.	AG	186.	100.0	.0	20.0	.22	20.7
6. PAWNEE WB Dep.	.0	10.0	-1000.0	10.0	1000.	270.	AG	670.	25.3	.0	40.0		
7. Railroad Appr.	.0	-1000.0	.0	.0	1000.	360.	AG	0.	.0	.0	50.0		
8. Railroad Dep.	.0	.0	.0	1000.0	1000.	360.	AG	0.	.0	.0	50.0		

JOB: WICHITA KS - RAILROAD PAWNEE St.   RUN: PAWNEE ST. AND RR, POSTMERG INC SPEED

DATE : 6/18/97
TIME : 17:24:24

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPHPL)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
2. PAWNEE EB Queue	3000	222	3.0	585	1620	469.50	1	3
5. PAWNEE WB Queue	3000	222	3.0	670	1620	469.50	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1 (SE CORNER)	35.0	-35.0	6.0
2. REC 2 (SW CORNER)	-35.0	-35.0	6.0
3. REC 3 (NW CORNER)	-35.0	35.0	6.0
4. REC 4 (NE CORNER)	35.0	35.0	6.0
5. REC 5 (NE MID-13th S	50.0	35.0	6.0
6. REC 6 (SE MID-13th S	50.0	-35.0	6.0
7. REC 7 (SE MID-RR)	35.0	-50.0	6.0
8. REC 8 (SW MID-RR)	-35.0	-50.0	6.0
9. REC 9 (SW MID-13th S	-50.0	-35.0	6.0
10. REC 10 (NW MID-13th	-50.0	35.0	6.0
11. REC 11 (NW MID-RR)	-35.0	50.0	6.0
12. REC 12 (NE MID-RR)	35.0	50.0	6.0

JOB: WICHITA KS - RAILROAD PAWNEE St. RUN: PAWNEE ST. AND RR, POSTNERG INC SPEED

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
0.	1.2	1.2	.0	.0	.0	1.2	.9	.9	1.4	.0	.0	.0
10.	1.1	1.0	.0	.0	.0	1.1	1.0	.8	1.2	.0	.0	.0
20.	1.1	1.0	.0	.0	.0	1.1	1.0	.8	1.2	.0	.0	.0
30.	1.2	1.0	.0	.0	.0	1.2	1.0	.9	1.2	.0	.0	.0
40.	1.3	1.0	.0	.0	.0	1.3	1.0	.8	1.4	.0	.0	.0
50.	1.5	1.2	.0	.0	.0	1.5	1.1	1.1	1.3	.0	.0	.0
60.	1.5	1.4	.0	.0	.0	1.5	1.2	1.2	1.3	.0	.0	.0
70.	1.6	1.6	.1	.1	.1	1.6	1.2	1.2	1.6	.1	.0	.0
80.	1.6	1.7	.6	.7	.7	1.6	1.1	1.2	1.6	.7	.4	.4
90.	1.1	1.2	1.4	1.4	1.4	1.1	.7	.8	1.2	1.3	.8	.8
100.	.5	.5	1.8	1.9	1.9	.5	.2	.2	.6	1.7	1.4	1.3
110.	.1	.1	1.7	1.9	1.9	.1	.0	.0	.1	1.7	1.3	1.5
120.	.0	.0	1.4	1.7	1.7	.0	.0	.0	.0	1.4	1.1	1.2
130.	.0	.0	1.1	1.6	1.6	.0	.0	.0	.0	1.1	1.0	1.2
140.	.0	.0	1.0	1.5	1.5	.0	.0	.0	.0	1.1	.9	1.1
150.	.0	.0	.9	1.4	1.3	.0	.0	.0	.0	1.0	.7	1.1
160.	.0	.0	1.0	1.3	1.3	.0	.0	.0	.0	1.0	.8	1.0
170.	.0	.0	.9	1.3	1.3	.0	.0	.0	.0	1.1	.8	1.0
180.	.0	.0	1.0	1.2	1.3	.0	.0	.0	.0	1.1	.9	1.0
190.	.0	.0	1.1	1.2	1.3	.0	.0	.0	.0	1.1	.9	1.0
200.	.0	.0	1.1	1.2	1.3	.0	.0	.0	.0	1.1	1.0	1.0
210.	.0	.0	1.2	1.2	1.3	.0	.0	.0	.0	1.1	1.0	.8
220.	.0	.0	1.4	1.3	1.4	.0	.0	.0	.0	1.4	1.0	1.0
230.	.0	.0	1.4	1.2	1.4	.0	.0	.0	.0	1.4	1.1	1.0
240.	.0	.0	1.5	1.5	1.6	.0	.0	.0	.0	1.5	1.1	1.1
250.	.1	.1	1.7	1.6	1.8	.1	.0	.0	.1	1.7	1.3	1.2
260.	.6	.6	1.6	1.6	1.6	.7	.3	.3	.6	1.6	1.1	1.3
270.	1.3	1.3	1.2	1.2	1.2	1.3	.9	.8	1.3	1.2	.7	.7
280.	1.7	1.9	.6	.5	.6	1.7	1.3	1.3	1.9	.6	.3	.3
290.	1.5	1.8	.1	.1	.1	1.6	1.2	1.3	1.8	.1	.0	.0
300.	1.3	1.7	.0	.0	.0	1.1	1.1	1.3	1.7	.0	.0	.0
310.	1.1	1.7	.0	.0	.0	1.1	1.0	1.2	1.7	.0	.0	.0
320.	.9	1.4	.0	.0	.0	1.1	.8	1.1	1.4	.0	.0	.0
330.	1.0	1.4	.0	.0	.0	1.1	.8	1.1	1.4	.0	.0	.0
340.	1.0	1.3	.0	.0	.0	1.1	.8	1.0	1.3	.0	.0	.0
350.	1.0	1.2	.0	.0	.0	1.1	.8	1.0	1.3	.0	.0	.0
360.	1.2	1.2	.0	.0	.0	1.2	.9	.9	1.4	.0	.0	.0
MAX	1.7	1.9	1.8	1.9	1.9	1.7	1.3	1.3	1.9	1.7	1.4	1.5
DEGR.	280	280	100	100	100	280	280	280	280	100	100	110

THE HIGHEST CONCENTRATION OF 1.90 PPM OCCURRED AT RECEPTOR REC2 .

JOB: WICHITA KS - RAILROAD PAWNEE St.   RUN: PAWNEE ST. AND RR, POSTHERG INC SPEED

DATE : 6/18/97
TIME : 17:24:24

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM)											
	* ANGLE (DEGREES)											
	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12
LINK #	280	280	100	100	100	280	280	280	280	100	100	110
1	.6	.8	.0	.0	.0	.5	.5	.5	.8	.0	.0	.0
2	.4	.6	.0	.0	.0	.4	.4	.4	.6	.0	.0	.0
3	.2	.0	.4	.4	.4	.3	.0	.0	.0	.4	.4	.4
4	.0	.0	.7	.9	.9	.0	.0	.0	.0	.6	.6	.6
5	.0	.0	.5	.6	.6	.0	.0	.0	.0	.4	.4	.5
6	.5	.5	.2	.0	.0	.5	.4	.4	.5	.3	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

Attachment C
EMISSIONS ANALYSIS CALCULATION SPREADSHEETS

Wichita CO NAA
Mitigation Option #1
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	0.4	0.02110	18.2
9.6	1.1	0.06260	18.2
9.6	9.0	0.49310	18.2
9.6	0.2	0.01160	18.2

Gallons Consumed	18.2

Wichita CO NAA
Mitigation Option #2
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.678
CO	2.001
NOx	15.760
PM	0.371

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.296
CO	3.258
NOx	0.084
PM	0.001

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	0.974
CO	5.258
NOx	15.844
PM	0.372

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.043
PM	0.001

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.001
CO	0.009
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.003
CO	0.014
NOx	0.043
PM	0.001

Wichita CO NAA
Mitigation Option #2
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0	0.13
y	101st N	0	0.09
y	61st N	0	0.38
y	Oliver	0	0.29
y	45th N	0	0.57
y	Hillside	0	0.76
y	37th N	0	1.56
y	21st N	0	6.72
y	17th N	0	1.77
	13th N	7.64	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
	Central	8.17	8.17
y	Lincoln	0	5.3
y	Harry	0	6.89
y	Mt. Vernon	0	2.67
y	Pawnee	0	14.46
y	MacArthur	0	4.05
y	47th S	0	2.79
y	55th S	0	0.98
y	63rd S	0	1.22
y	71st S	0	2.14
y	79th S	0	0.18
y	103rd S	0	0.24
y	Meridian	0	0.14
y	119th S	0	0.03
	All	21.82	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	736.7
CO	8103.7
NOx	209.2
PM	3.2

Wichita CO NAA
Mitigation Option #2
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	0.4	0.02110	18.2
9.6	1.1	0.06260	18.2
9.6	9.0	0.49310	18.2
9.6	0.2	0.01160	18.2

Gallons Consumed	18.2

Wichita CO NAA
Mitigation Option #3
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.678
CO	2.001
NOx	15.780
PM	0.371

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.043
PM	0.001

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.185
CO	2.038
NOx	0.053
PM	0.001

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.001
CO	0.006
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	0.863
CO	4.039
NOx	15.813
PM	0.372

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.002
CO	0.011
NOx	0.043
PM	0.001

Wichita CO NAA
Mitigation Option #3
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0	0.13
y	101st N	0	0.09
y	61st N	0	0.38
y	Oliver	0	0.29
y	45th N	0	0.57
y	Hillside	0	0.76
y	37th N	0	1.56
y	21st N	0	6.72
y	17th N	0	1.77
	13th N	7.64	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
y	Central	0	8.17
y	Lincoln	0	5.3
y	Harry	0	6.89
y	Mt. Vernon	0	2.67
y	Pawnee	0	14.46
y	MacArthur	0	4.05
y	47th S	0	2.79
y	55th S	0	0.98
y	63rd S	0	1.22
y	71st S	0	2.14
y	79th S	0	0.18
y	103rd S	0	0.24
y	Meridian	0	0.14
y	119th S	0	0.03
	All	13.65	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	460.9
CO	5069.4
NOx	130.9
PM	2.0

Wichita CO NAA
Mitigation Option #3
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	0.4	0.02110	18.2
9.6	1.1	0.06260	18.2
9.6	9.0	0.49310	18.2
9.6	0.2	0.01160	18.2

Gallons Consumed	18.2

Wichita CO NAA
Mitigation Options #4 and #5
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.678
CO	2.001
NOx	15.760
PM	0.371

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.043
PM	0.001

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.082
CO	0.897
NOx	0.023
PM	0.000

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.000
CO	0.002
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	0.759
CO	2.898
NOx	15.783
PM	0.371

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.002
CO	0.008
NOx	0.043
PM	0.001

Wichita CO NAA
Mitigation Options #4 and #5
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0	0.13
y	101st N	0	0.09
y	61st N	0	0.38
y	Oliver	0	0.29
y	45th N	0	0.57
y	Hillside	0	0.76
y	37th N	0	1.56
y	21st N	0	6.72
y	17th N	0	1.77
y	13th N	0	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
y	Central	0	8.17
y	Lincoln	0	5.3
y	Harry	0	6.89
y	Mt. Vernon	0	2.67
y	Pawnee	0	14.46
y	MacArthur	0	4.05
y	47th S	0	2.79
y	55th S	0	0.98
y	63rd S	0	1.22
y	71st S	0	2.14
y	79th S	0	0.18
y	103rd S	0	0.24
y	Meridian	0	0.14
y	119th S	0	0.03
	All	6.01	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	202.9
CO	2232.0
NOx	57.6
PM	0.9

Wichita CO NAA
Mitigation Options #4 and #5
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	0.4	0.02110	18.2
9.6	1.1	0.06260	18.2
9.6	9.0	0.49310	18.2
9.6	0.2	0.01160	18.2

Gallons Consumed	18.2

Wichita CO NAA
Mitigation Option #6
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.678
CO	2.001
NOx	15.760
PM	0.371

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.043
PM	0.001

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.000
CO	0.000
NOx	0.000
PM	0.000

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.000
CO	0.000
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	0.678
CO	2.001
NOx	15.760
PM	0.371

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.043
PM	0.001

Wichita CO NAA
Mitigation Option #6
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0	0.13
y	101st N	0	0.09
y	61st N	0	0.38
y	Oliver	0	0.29
y	45th N	0	0.57
y	Hillside	0	0.76
y	37th N	0	1.56
y	21st N	0	6.72
y	17th N	0	1.77
y	13th N	0	7.64
y	9th N	0	0.71
y	Murdock	0	5.3
y	Central	0	8.17
y	Lincoln	0	5.3
y	Harry	0	6.89
y	Mt. Vernon	0	2.67
y	Pawnee	0	14.46
y	MacArthur	0	4.05
y	47th S	0	2.79
y	55th S	0	0.98
y	63rd S	0	1.22
y	71st S	0	2.14
y	79th S	0	0.18
y	103rd S	0	0.24
y	Meridian	0	0.14
y	119th S	0	0.03
	All	-	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	0.0
CO	0.0
NOx	0.0
PM	0.0

Wichita CO NAA
Mitigation Option #6
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	0.4	0.02110	18.2
9.6	1.1	0.06260	18.2
9.6	9.0	0.49310	18.2
9.6	0.2	0.01160	18.2

Gallons Consumed	18.2

Sedgwick County
Pre-Merger Emission
Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	3.704
CO	10.936
NOx	86.139
PM	2.026

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.010
CO	0.030
NOx	0.236
PM	0.006

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	1.102
CO	12.124
NOx	0.313
PM	0.005

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.003
CO	0.033
NOx	0.001
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	4.807
CO	23.059
NOx	86.452
PM	2.031

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.013
CO	0.063
NOx	0.237
PM	0.006

Sedgwick County
Pre-Merger Emission
Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.07	0.07
	101st N	0.04	0.04
	61st N	0.19	0.19
	Oliver	0.15	0.15
	45th N	0.35	0.35
	Hillside	0.54	0.54
	37th N	0.84	0.84
	21st N	8.15	8.15
	17th N	2.14	2.14
	13th N	9.25	9.25
	9th N	0.87	0.87
	Murdock	6.42	6.42
	Central	9.51	9.51
	Lincoln	4.97	4.97
	Harry	6.11	6.11
	Mt. Vernon	2.62	2.62
	Pawnee	14.80	14.80
	MacArthur	5.14	5.14
	47th S	3.60	3.60
	55th S	1.18	1.18
	63rd S	1.49	1.49
	71st S	2.40	2.40
	79th S	0.14	0.14
	103rd S	0.14	0.14
	Meridian	0.08	0.08
	119th S	0.02	0.02
	All	81.21	81.21

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	2741.9
CO	30160.4
NOx	778.6
PM	12.0

Sedgwick County
Pre-Merger Emission
Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
4	5.1	0.02110	239.3
4	15.0	0.06260	239.3
4	118.0	0.49310	239.3
4	2.8	0.01160	239.3

Gallons Consumed	239.3

Sedgwick County
Post-Merger Unmitigated
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	8.890
CO	26.245
NOx	206.734
PM	4.863

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.024
CO	0.072
NOx	0.566
PM	0.013

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	3.719
CO	40.906
NOx	1.056
PM	0.016

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.010
CO	0.112
NOx	0.003
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	12.609
CO	67.151
NOx	207.790
PM	4.880

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.035
CO	0.184
NOx	0.569
PM	0.013

Sedgwick County
Post-Merger Unmitigated
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.21	0.21
	101st N	0.14	0.14
	61st N	0.61	0.61
	Oliver	0.48	0.48
	45th N	1.19	1.19
	Hillside	1.83	1.83
	37th N	2.88	2.88
	21st N	27.89	27.89
	17th N	7.33	7.33
	13th N	31.68	31.68
	9th N	2.96	2.96
	Murdock	21.97	21.97
	Central	32.53	32.53
	Lincoln	16.81	16.81
	Harry	20.63	20.63
	Mt. Vernon	8.87	8.87
	Pawnee	50.55	50.55
	MacArthur	17.2	17.2
	47th S	11.94	11.94
	55th S	3.88	3.88
	63rd S	4.37	4.37
	71st S	7	7
	79th S	0.4	0.4
	103rd S	0.38	0.38
	Meridian	0.23	0.23
	119th S	0.04	0.04
	All	274.00	274.00

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	9250.9
CO	101760.2
NOx	2627.0
PM	40.4

Sedgwick County
Post-Merger Unmitigated
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	5.1	0.02110	239.3
9.6	15.0	0.06260	239.3
9.6	118.0	0.49310	239.3
9.6	2.8	0.01160	239.3

Gallons Consumed	239.3

Sedgwick County
Mitigation Option #1
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	10.525
CO	31.071
NOx	244.746
PM	5.758

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	1.020
CO	11.224
NOx	0.290
PM	0.004

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	11.546
CO	42.295
NOx	245.036
PM	5.762

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.029
CO	0.085
NOx	0.671
PM	0.016

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.003
CO	0.031
NOx	0.001
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.032
CO	0.116
NOx	0.671
PM	0.016

Sedgwick County
Mitigation Option #1
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.13	0.13
	101st N	0.09	0.09
	61st N	0.38	0.38
	Oliver	0.29	0.29
	45th N	0.57	0.57
	Hillside	0.76	0.76
	37th N	1.56	1.56
	21st N	6.72	6.72
	17th N	1.77	1.77
	13th N	7.64	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
	Central	8.17	8.17
	Lincoln	5.3	5.3
	Harry	6.89	6.89
	Mt. Vernon	2.67	2.67
	Pawnee	14.46	14.46
	MacArthur	4.05	4.05
	47th S	2.79	2.79
	55th S	0.98	0.98
	63rd S	1.22	1.22
	71st S	2.14	2.14
	79th S	0.18	0.18
	103rd S	0.24	0.24
	Meridian	0.14	0.14
	119th S	0.03	0.03
	All	75.18	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	2538.3
CO	27920.9
NOx	720.8
PM	11.1

Sedgwick County
Mitigation Option #1
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	6.0	0.02110	283.3
9.6	17.7	0.06260	283.3
9.6	139.7	0.49310	283.3
9.6	3.3	0.01160	283.3

Gallons Consumed	283.3

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Sedgwick County
Mitigation Option #2
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	10.525
CO	31.071
NOx	244.746
PM	5.758

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.029
CO	0.085
NOx	0.671
PM	0.016

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.824
CO	9.065
NOx	0.234
PM	0.004

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.002
CO	0.025
NOx	0.001
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	11.349
CO	40.136
NOx	244.980
PM	5.761

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.031
CO	0.110
NOx	0.671
PM	0.016

Sedgwick County
Mitigation Option #2
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.13	0.13
	101st N	0.09	0.09
	61st N	0.38	0.38
	Oliver	0.29	0.29
	45th N	0.57	0.57
	Hillside	0.76	0.76
	37th N	1.56	1.56
	21st N	6.72	6.72
	17th N	1.77	1.77
	13th N	7.64	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
	Central	8.17	8.17
	Lincoln	5.3	5.3
	Harry	6.89	6.89
	Mt. Vernon	2.67	2.67
y	Pawnee	0	14.46
	MacArthur	4.05	4.05
	47th S	2.79	2.79
	55th S	0.98	0.98
	63rd S	1.22	1.22
	71st S	2.14	2.14
	79th S	0.18	0.18
	103rd S	0.24	0.24
	Meridian	0.14	0.14
	119th S	0.03	0.03
	All	60.72	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	2050.1
CO	22550.6
NOx	582.2
PM	9.0

Sedgwick County
Mitigation Option #2
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	6.0	0.02110	283.3
9.6	17.7	0.06260	283.3
9.6	139.7	0.49310	283.3
9.6	3.3	0.01160	283.3

Gallons Consumed	283.3

Sedgwick County
Mitigation Option #3
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	10.525
CO	31.071
NOx	244.746
PM	5.758

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.029
CO	0.085
NOx	0.671
PM	0.016

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.713
CO	7.845
NOx	0.203
PM	0.003

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.002
CO	0.021
NOx	0.001
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	11.238
CO	38.916
NOx	244.949
PM	5.761

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.031
CO	0.107
NOx	0.671
PM	0.016

Sedgwick County
Mitigation Option #3
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.13	0.13
	101st N	0.09	0.09
	61st N	0.38	0.38
	Oliver	0.29	0.29
	45th N	0.57	0.57
	Hillside	0.76	0.76
	37th N	1.56	1.56
	21st N	6.72	6.72
	17th N	1.77	1.77
	13th N	7.64	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
y	Central	0	8.17
	Lincoln	5.3	5.3
	Harry	6.89	6.89
	Mt. Vernon	2.67	2.67
y	Pawnee	0	14.46
	MacArthur	4.05	4.05
	47th S	2.79	2.79
	55th S	0.98	0.98
	63rd S	1.22	1.22
	71st S	2.14	2.14
	79th S	0.18	0.18
	103rd S	0.24	0.24
	Meridian	0.14	0.14
	119th S	0.03	0.03
	All	52.55	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	1774.2
CO	19516.4
NOx	503.8
PM	7.8

Sedgwick County
Mitigation Option #3
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	6.0	0.02110	283.3
9.6	17.7	0.06260	283.3
9.6	139.7	0.49310	283.3
9.6	3.3	0.01160	283.3

Gallons Consumed	283.3

Sedgwick County
Mitigation Option #4
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	10.525
CO	31.071
NOx	244.746
PM	5.758

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.029
CO	0.085
NOx	0.671
PM	0.016

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.610
CO	6.705
NOx	0.173
PM	0.003

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.002
CO	0.018
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	11.135
CO	37.776
NOx	244.919
PM	5.760

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.031
CO	0.103
NOx	0.671
PM	0.016

Sedgwick County
Mitigation Option #4
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.13	0.13
	101st N	0.09	0.09
	61st N	0.38	0.38
	Oliver	0.29	0.29
	45th N	0.57	0.57
	Hillside	0.76	0.76
	37th N	1.56	1.56
	21st N	6.72	6.72
	17th N	1.77	1.77
y	13th N	0	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
y	Central	0	8.17
	Lincoln	5.3	5.3
	Harry	6.89	6.89
	Mt. Vernon	2.67	2.67
y	Pawnee	0	14.46
	MacArthur	4.05	4.05
	47th S	2.79	2.79
	55th S	0.98	0.98
	63rd S	1.22	1.22
	71st S	2.14	2.14
	79th S	0.18	0.18
	103rd S	0.24	0.24
	Meridian	0.14	0.14
	119th S	0.03	0.03
	All	44.91	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	1516.3
CO	16679.0
NOx	430.6
PM	6.6

Sedgwick County
Mitigation Option #4
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	6.0	0.02110	283.3
9.6	17.7	0.06260	283.3
9.6	139.7	0.49310	283.3
9.6	3.3	0.01160	283.3

Gallons Consumed	283.3

Sedgwick County
Mitigation Option #5
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	10.525
CO	31.071
NOx	244.746
PM	5.758

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.518
CO	5.701
NOx	0.147
PM	0.002

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	11.043
CO	36.772
NOx	244.893
PM	5.760

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.029
CO	0.085
NOx	0.671
PM	0.016

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.001
CO	0.016
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.030
CO	0.101
NOx	0.671
PM	0.016

Sedgwick County
Mitigation Option #5
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.13	0.13
	101st N	0.09	0.09
	61st N	0.38	0.38
	Oliver	0.29	0.29
	45th N	0.57	0.57
	Hillside	0.76	0.76
	37th N	1.56	1.56
y	21st N	0	6.72
	17th N	1.77	1.77
y	13th N	0	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
y	Central	0	8.17
	Lincoln	5.3	5.3
	Harry	6.89	6.89
	Mt. Vernon	2.67	2.67
y	Pawnee	0	14.46
	MacArthur	4.05	4.05
	47th S	2.79	2.79
	55th S	0.98	0.98
	63rd S	1.22	1.22
	71st S	2.14	2.14
	79th S	0.18	0.18
	103rd S	0.24	0.24
	Meridian	0.14	0.14
	119th S	0.03	0.03
	All	38.19	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	1289.4
CO	14183.3
NOx	366.1
PM	5.6

Sedgwick County
Mitigation Option #5
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	6.0	0.02110	283.3
9.6	17.7	0.06260	283.3
9.6	139.7	0.49310	283.3
9.6	3.3	0.01160	283.3

Gallons Consumed	283.3

Sedgwick County
Mitigation Option #6
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	10.525
CO	31.071
NOx	244.746
PM	5.758

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.029
CO	0.085
NOx	0.671
PM	0.016

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.609
CO	6.699
NOx	0.173
PM	0.003

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.002
CO	0.018
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	11.134
CO	37.770
NOx	244.919
PM	5.760

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.031
CO	0.103
NOx	0.671
PM	0.016

Sedgwick County
Mitigation Option #6
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
	Greenwich	0.13	0.13
	101st N	0.09	0.09
	61st N	0.38	0.38
	Oliver	0.29	0.29
	45th N	0.57	0.57
	Hillside	0.76	0.76
	37th N	1.56	1.56
y	21st N	0	6.72
y	17th N	0	1.77
y	13th N	0	7.64
y	9th N	0	0.71
y	Murdock	0	5.3
y	Central	0	8.17
	Lincoln	5.3	5.3
	Harry	6.89	6.89
	Mt. Vernon	2.67	2.67
	Pawnee	14.46	14.46
	MacArthur	4.05	4.05
	47th S	2.79	2.79
	55th S	0.98	0.98
	63rd S	1.22	1.22
	71st S	2.14	2.14
	79th S	0.18	0.18
	103rd S	0.24	0.24
	Meridian	0.14	0.14
	119th S	0.03	0.03
	All	44.87	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	1514.9
CO	16664.2
NOx	430.2
PM	5.6

Sedgwick County
Mitigation Option #6
Emission Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal)	Fuel Consumption (gal/train)
9.6	6.0	0.02110	283.3
9.6	17.7	0.06260	283.3
9.6	139.7	0.49310	283.3
9.6	3.3	0.01160	283.3

Gallons Consumed	283.3

Wichita CO NAA
Pre-Merger Emission
Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.239
CO	0.704
NOx	5.547
PM	0.130

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.001
CO	0.002
NOx	0.015
PM	0.000

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.354
CO	3.889
NOx	0.100
PM	0.002

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.001
CO	0.011
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	0.592
CO	4.593
NOx	5.647
PM	0.132

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.002
CO	0.013
NOx	0.015
PM	0.000

Wichita CO NAA
Pre-Merger Emission
Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0.00	0.07
y	101st N	0.00	0.04
y	61st N	0.00	0.19
y	Oliver	0.00	0.15
y	45th N	0.00	0.35
y	Hillside	0.00	0.54
y	37th N	0.00	0.84
y	21st N	0.00	8.15
y	17th N	0.00	2.14
	13th N	9.25	9.25
	9th N	0.87	0.87
	Murdock	6.42	6.42
	Central	9.51	9.51
y	Lincoln	0.00	4.97
y	Harry	0.00	6.11
y	Mt. Vernon	0.00	2.62
y	Pawnee	0.00	14.80
y	MacArthur	0.00	5.14
y	47th S	0.00	3.60
y	55th S	0.00	1.13
y	63rd S	0.00	1.49
y	71st S	0.00	2.40
y	79th S	0.00	0.14
y	103rd S	0.00	0.14
y	Meridian	0.00	0.08
y	119th S	0.00	0.02
	All	26.05	81.21

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	879.5
CO	9674.6
NOx	249.8
PM	3.8

Wichita CO NAA
Pre-Merger Emission
Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal	Fuel Consumption (gal/train)
4	0.3	0.02110	15.4
4	1.0	0.06260	15.4
4	7.6	0.49310	15.4
4	0.2	0.01160	15.4

Gallons Consum	15.4

Wichita CO NAA
Post-Merger Emission
Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.572
CO	1.690
NOx	13.312
PM	0.313

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.036
PM	0.001

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	1.210
CO	13.308
NOx	0.344
PM	0.005

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.003
CO	0.036
NOx	0.001
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	1.782
CO	14.998
NOx	13.656
PM	0.318

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.005
CO	0.041
NOx	0.037
PM	0.001

5

Wichita CO NAA
Post-Merger Emission
Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0	0.21
y	101st N	0	0.14
y	61st N	0	0.61
y	Oliver	0	0.48
y	45th N	0	1.19
y	Hillside	0	1.83
y	37th N	0	2.88
y	21st N	0	27.89
y	17th N	0	7.33
	13th N	31.68	31.68
	9th N	2.96	2.96
	Murdock	21.97	21.97
	Central	32.53	32.53
y	Lincoln	0	16.81
y	Harry	0	20.63
y	Mt. Vernon	0	8.87
y	Pawnee	0	50.55
y	MacArthur	0	17.2
y	47th S	0	11.94
y	55th S	0	3.88
y	63rd S	0	4.37
y	71st S	0	7
y	79th S	0	0.4
y	103rd S	0	0.38
y	Meridian	0	0.23
y	119th S	0	0.04
	All	89.14	274.00

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	3009.6
CO	33105.5
NOx	854.6
PM	13.1

Wichita CO NAA
Post-Merger Emission
Calculations

Train Data

trains/day	Emissions (lb/train)	Emissions (lb/gal	Fuel Consumption (gal/train)
9.6	0.3	0.02110	15.4
9.6	1.0	0.06260	15.4
9.6	7.6	0.49310	15.4
9.6	0.2	0.01160	15.4

Gallons Consum	15.4

Wichita CO NAA
Mitigation Option #1
Emission Calculations

Train Emissions

Pollutant	Emissions (tpy)
VOC	0.678
CO	2.001
NOx	15.760
PM	0.371

Idling Vehicle Emissions

Pollutant	Emissions (tpy)
VOC	0.296
CO	3.258
NOx	0.084
PM	0.001

Total Emissions (Train + Vehicle Idling)

	Emissions (tpy)
VOC	0.974
CO	5.258
NOx	15.844
PM	0.372

Train Emissions

Pollutant	Emissions (tpd)
VOC	0.002
CO	0.005
NOx	0.043
PM	0.001

Idling Vehicle Emissions

Pollutant	Total Emissions (tpd)
VOC	0.001
CO	0.009
NOx	0.000
PM	0.000

Total Emissions (Train + Vehicle Idling)

	Total Emissions (tpd)
VOC	0.003
CO	0.014
NOx	0.043
PM	0.001

Wichita CO NAA
Mitigation Option #1
Emission Calculations

Average Vehicle Emission Factors

Pollutant	Average (g/hr)	Average (g/mi)
VOC	33.8	13.505
CO	371.4	148.555
NOx	9.6	3.835
PM	0.1	0.059

Grade Separation	Location	Hours of Delay	Input Hours of Delay
y	Greenwich	0	0.13
y	101st N	0	0.09
y	61st N	0	0.38
y	Oliver	0	0.29
y	45th N	0	0.57
y	Hillside	0	0.76
y	37th N	0	1.56
y	21st N	0	6.72
y	17th N	0	1.77
	13th N	7.64	7.64
	9th N	0.71	0.71
	Murdock	5.3	5.3
	Central	8.17	8.17
y	Lincoln	0	5.3
y	Harry	0	6.89
y	Mt. Vernon	0	2.67
y	Pawnee	0	14.46
y	MacArthur	0	4.05
y	47th S	0	2.79
y	55th S	0	0.98
y	63rd S	0	1.22
y	71st S	0	2.14
y	79th S	0	0.18
y	103rd S	0	0.24
y	Meridian	0	0.14
y	119th S	0	0.03
	All	21.82	75.18

Total Emissions from Idling Vehicles

Pollutant	Total Emissions (gpd)
VOC	736.7
CO	8103.7
NOx	209.2
PM	3.2

Attachment D

LOCOMOTIVE EMISSION CONTROL TECHNIQUES AND THE FEASIBILITY OF EARLY INTRODUCTION OF LOW-EMISSION LOCOMOTIVES

D.1 DIESEL ENGINE MODIFICATIONS

Several emission control techniques for NO_x and PM are well-established in heavy-duty on-road truck engines. These include the following:

- Retarded injection timing.
- Enhanced charge air cooling in turbocharged engines.
- Electronic fuel injection control.
- Conversion from two-stroke to four-stroke cycle.

To a lesser degree, these techniques also have been applied or are being incorporated into locomotive engines. Since the early 1980s, emission standards have been a principal driver in the development and application of emission controls to on-road diesel engines. Lacking this driver until only recently, locomotive engine manufacturers have not given much effort to developing emission controls in the past. Much of the published work on applying emission control techniques to locomotives has been funded by the North American railroads, through the Association of American Railroads' (AAR) Locomotive Improvement program. The AAR has contracted much of the work under this program to Southwest Research Institute. Since 1988, the Locomotive Improvement Program has been focused on developing and refining locomotive emission testing procedures, establishing baseline emission rates for the most representative North American locomotive models, and investigating the effects of several readily-available emission control techniques. Many of the data cited here were generated by this program.

D.1.1 Retarded Injection Timing

In the absence of any other considerations, locomotive engine designers time the fuel injection event so as to maximize the engine's torque in throttle notches 7-8 (this is referred to as maximum brake torque timing or MBT timing), which also maximizes fuel efficiency and power output. Retarding the beginning of injection, relative to MBT timing, will usually decrease the NO_x rate by reducing the duration of the high combustion temperatures that promote the formation of NO_x. However, this also reduces the time available to complete the combustion of PM, which always forms early in the combustion process. This is the basis for the classic tradeoff in controlling diesel NO_x and PM: techniques to reduce one tend to increase the other.

In most diesel engines, moderately retarding the beginning of injection produces significant NO_x reductions, at the cost of some increase in PM and fuel consumption rates. This phenomenon has been widely observed in emission tests of locomotive engines. Tests performed by the Southwest Research Institute for the AAR have investigated the effects of retarding the beginning of injection over a range of 2 to 12 degrees of crank angle. These tests have established that 4 degrees crank usually results in a good compromise between NO_x reduction and elevation of PM rates and BSFC. (Figure D-1 shows typical trends). The impact of 4 degrees of timing retard in a number of widely used locomotive models is shown in Figures D-2 and D-3 below. The NO_x reduction varies somewhat by locomotive model. For most models, the NO_x reduction is approximately 25 percent, although a reduction of as little as 17 percent was reported for a current-model GE passenger locomotive (GE AMD-103) (Figure D-2). The observed NO_x reductions are accompanied by PM increases ranging between five and 35 percent (Figure D-2), and increases in brake-specific fuel consumption between one and two percent (Figure D-3).

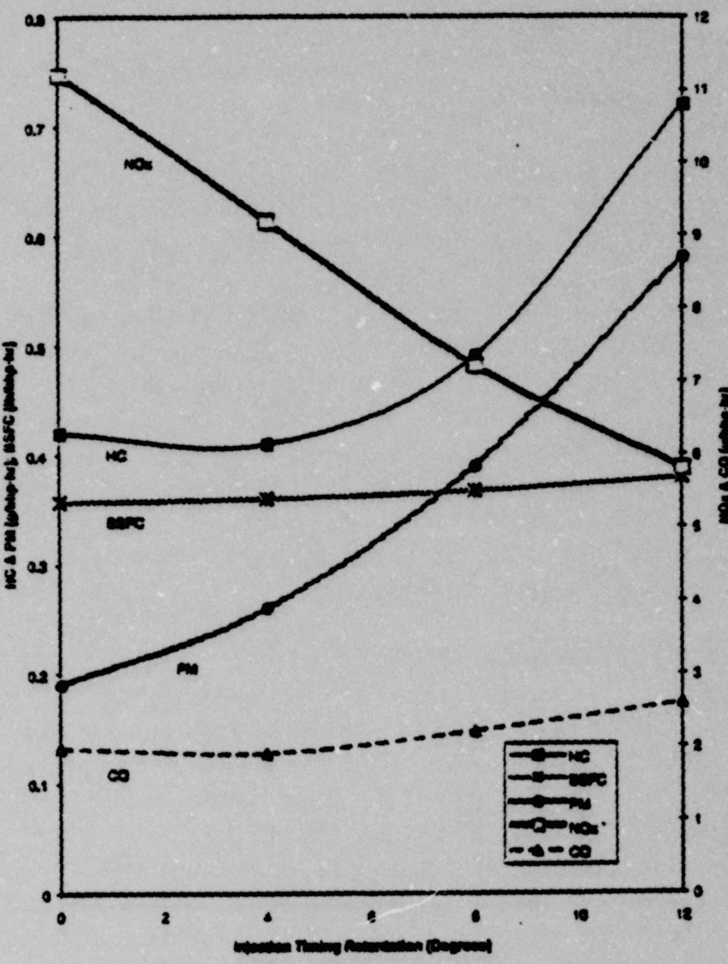


Figure D-1. Effect of retarding fuel injection timing in a GE 12-7FDL locomotive engine (Reference D-1)

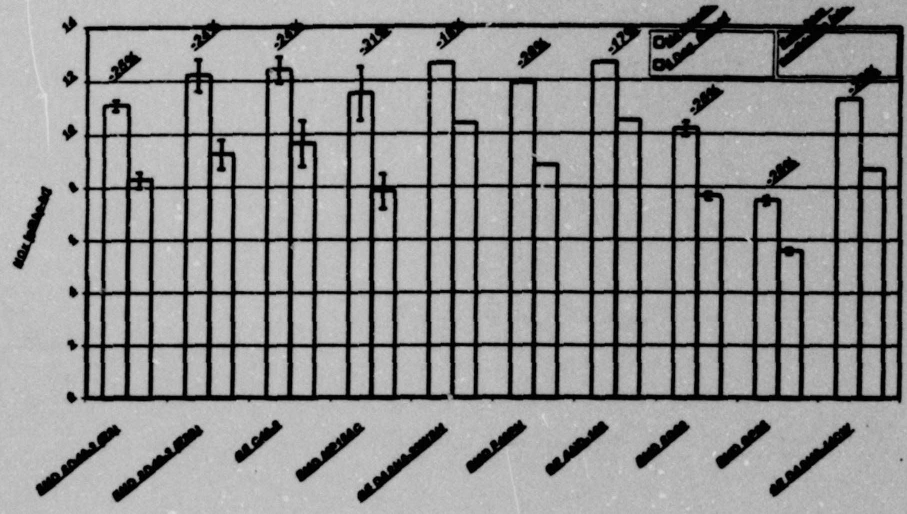
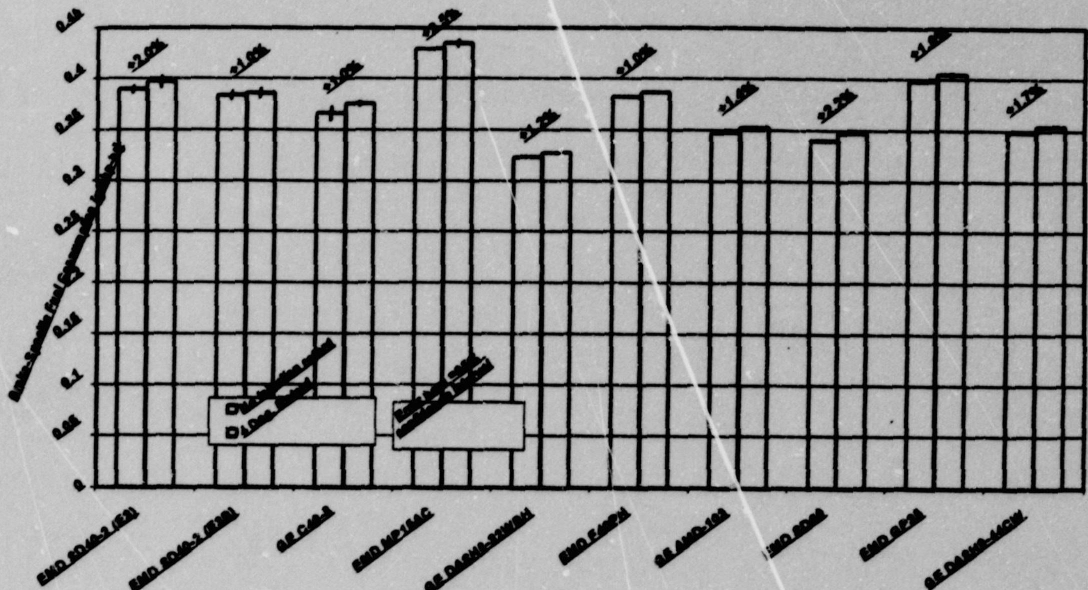


Figure D-2. Effect of retarding injection timing on NO_x and PM for several locomotive models

Figure D-3. Effect of retarded injection timing on brake-specific fuel consumption for several locomotive models



Transient and steady-state exhaust opacity are also increased as a side effect of retarding injection timing. The effect is generally more severe in GE locomotives than EMD locomotives.

To summarize, retarding fuel injection timing has been shown to be an effective means of reducing NO_x emissions from locomotives, but is accompanied by increases in PM, exhaust opacity and brake specific fuel consumption, which vary by locomotive model. The main cost of this technique to the railroads is the one to two percent increase in fuel bill for units with retarded timing. The magnitude of this cost would vary dramatically to the extent that units with retarded timing could be dedicated to service through Wichita. With random dispatching of line haul locomotives through the entire UP/SP system, a large increase in fuel bills would be needed to assure that Wichita realize the full NO_x benefit associated with injection timing retardation.

Retarding the injection timing could be performed during any scheduled 90-day servicing. Therefore, the entire fleet could be so modified in less than six months.

D.1.2 Enhanced Charge Air Cooling

Current line haul locomotive engines employ turbocharging and charge air aftercooling to reduce visible smoke emissions and as a means of increasing power density and fuel efficiency and promoting engine cooling. Conventional locomotive charge air coolers use the engine coolant as the cooling medium. This configuration prevents the intake air from being cooled to temperatures below that of the engine coolant – normally 180° F. Emission testing has shown that cooling the charge air temperature to lower temperatures can reduce locomotive NO_x rates to some degree (Table D-1). This is achievable in a locomotive by using separate cooling systems for the engine and charge air cooler.

Table D-1. Effect of decreasing aftercooling temperature on exhaust emission rates – EMD 12-645E3B engine with 4° retarded injection timing (Reference D-1)

	PM	HC	CO	NO_x
Aftercooler Temperature	g/bhp-hr			
210°F	0.24	0.40	0.85	8.89
195°F	0.25	0.38	0.95	8.12
180°F	0.23	0.38	0.92	7.98
165°F	0.23	0.39	0.93	7.88

Note: Emissions were measured over the AAR 3-mode duty cycle (50% idle, 25% Notch 5, and 25% Notch 8).

GM-EMD has developed separate circuit charge coolers as original equipment on its latest locomotive models (e.g., the SD90MAC), and for retrofitting into at least one earlier-model locomotive engine. Specifically, a separate circuit aftercooler is part of an advanced overhaul package for the EMD 645F3B, which powers SD50 freight locomotives offered in the early-mid 1980s. As originally configured, this engine has suffered from frequent premature mechanical failures which are likely related to excessively high thermal loads and combustion pressures. The original engine's NO_x rates also were likely high, as well. The advanced overhaul package was developed to improve the durability of this engine, and was also designed with NO_x reductions in mind. This package consists of the following:

- A more effective aftercooler with a four pass heat exchanger, instead of the original model's two pass design.
- A separate circuit for the charge air coolant, resulting in lower charge air temperatures.
- Six blade engine coolant radiator fans in place of 4-blade fans, which provide higher flow rates of cooling air.
- Addition of a thermostat to limit coolant flow to the engine. This is apparently needed in cold weather operation with the more effective modified cooling system.
- Fuel injectors modified with a new hole pattern and spray angle
- Beginning of injection timing retarded 2 degrees of crank from MBT timing (Reference D-2).

Emissions data from an EMD SD50 freight locomotive equipped with the advanced overhaul package are shown in Table D-2 below. While these data are based on the AAR 3-mode duty cycle, which is not the same as the EPA's proposed line haul cycle, the AAR cycle data are usually similar to those based on line haul cycles. Comparing these rates with the proposed EPA locomotive emission standards suggests that this package meets the Tier 0 NO_x standard, and has a PM rate well below the Tier 0 standard. This package therefore appears to offer significant NO_x reductions, combined with low emission rates of the other major pollutants. This package could be installed in all EMD freight locomotives equipped with 645-series engines (Reference D-3).

Table D-2. Exhaust emission measurements for the EMD 645F3B, equipped with EMD's Advanced Overhaul Package

	AAR 3-mode Composite Emission Rate (g/bhp hr)			
No. of Units Tested	HC	CO	NO_x	PM
4	0.26 to 0.33	0.77 to 2.4	8.9 to 9.8	0.28 to 0.34

The most cost-effective time to perform such an upgrade is during the major engine overhaul that is normally scheduled once every 5-6 years in service. If 20 percent of the fleet is overhauled in 1998, and then in 1999, then approximately 40 percent of the UP/SP units with 645-series engines could be equipped with this package by January 2000. Forty percent of the EMD 645 powered fleet would already meet Tier 0 when the Tier 0 standard first takes effect.

D.1.3 Electronic Fuel Injection (EFI) Control

Manufacturers of heavy-duty automotive diesel engines began offering models equipped with electronically controlled fuel injection in the late 1980s. Incorporating electronic control allows injection timing and fuel quantity to be varied optimally for engine speed, load, air flowrate, and temperature. It is widely considered to be a key technology for simultaneously achieving low PM and NO_x rates, along with excellent fuel economy. Both EMD and GE have introduced electronic fuel injection systems in their latest locomotive engine models. These systems are currently optimized for fuel economy, and not emission reductions. Both manufacturers have investigated low NO_x control algorithms for their electronic injection systems. EMD can offer locomotives with low NO_x calibration, at the customer's request. Emission testing to verify the performance of the low NO_x calibration has been quite limited, so such testing should be performed in conjunction with the locomotive order (Reference D-3). Both EMD and GE will conduct more optimization of their EFI calibration for emission control, once the EPA's proposed locomotive emission standards is established.

Electronic injection control entails the installation of sensors measuring crank angle, injector needle lift, engine coolant temperature, and intake air temperature and flow rate. Retrofitting electronic injection control into in-service locomotives should be feasible during major rebuilds, assuming that the engine manufacturers develop and offer suitable retrofit packages for their various engine models.

D.1.4 Conversion from Two-Stroke to Four-Stroke Cycle

EMD locomotive engines have always utilized a two-stroke cycle, while GE locomotives have used a four-stroke cycle. In two-stroke, uniflow scavenged engines, such as the EMD 545, 645, and 710 Series, the intake air is fed into the crankcase from the blower or turbocharger, and then flows into each cylinder through a number of intake ports. In this arrangement, substantial amounts of lubricating oil from the crankcase are delivered into the combustion chamber as mist entrained along with the intake air. The lubricating oil does not burn completely, and it contributes to exhaust PM emissions. Approximately 50 percent of the exhaust particulate matter in two-stroke EMD locomotive engines has been measured to consist of lubricating oil. In contrast, the lubricating oil fraction of PM from GE locomotive engines is normally less than 20 percent.

In automotive diesel engines, PM rates as low as 0.06 g/bhp-hr are achieved through two means:

- Optimizing the combustion process to minimize the formation of solid carbonaceous PM formed during combustion of diesel fuel.

- Minimizing the amount of lubricating oil passing into the combustion chamber, using four stroke designs with rings, cylinder liners and valve stem seals which are optimized for very low oil leakage.

Because of their intractably high oil consumption and associated PM emissions, two-stroke diesel engines have been driven out of the North American automotive engine market. Fuel efficiency is a key driver in the locomotive engine market, and four-stroke engines are capable of somewhat higher fuel efficiency. Principally because of fuel efficiency considerations, EMD has recently introduced its first four-stroke locomotive engines into the marketplace. With EPA's proposed locomotive emission standards calling for simultaneous control of PM and NO_x, the conversion of the North American locomotive market to four-stroke motive power will likely be completed during the next decade.

Advanced four-stroke diesel locomotive engines have recently been introduced by EMD and by GE Transportation Systems in affiliation with Deutz . Both of these engines have been designed with likely future emission standards in mind. While no emission data from these engines are available, the engines may well achieve lower NO_x and PM combinations than older North American locomotive models. These engines are substantially more powerful than traditional 4,000 hp North American locomotive prime movers. Recently-developed AC traction motors and power control systems are needed to utilize properly the additional power. Accordingly, retrofitting these engines into existing units is probably not feasible. UP/SP would have to purchase locomotives equipped with these advanced engines and concentrate their operations on lines through Reno, NV and Wichita.

D.2 IMPROVED DIESEL FUELS

In October 1993, both the EPA and the ARB introduced standards for the composition of on-road diesel fuel. These standards required that sulfur content be reduced to below 0.05 percent, and also specified minimum cetane numbers. The ARB standard limits aromatic content to less than 20 percent. High cetane, low aromatic, low sulfur fuels have been shown to reduce NO_x, PM, or both, in some on-road diesel engine models. A similar effect has been documented for locomotive engines. Using improved or reformulated diesel has been suggested to offset the increase in PM which ordinarily occurs when retarded injection timing is used to reduce NO_x emissions (Reference D-4). Examples of the progressive effects of retarded fuel injection timing, enhanced aftercooling and improved diesel fuel in locomotive engines are shown in Table D-3.

D-3 DIESEL EXHAUST AFTERTREATMENT

Power output in a diesel engine is controlled mainly through the quantity of fuel injected. No throttling of intake air takes place, as in an otto-cycle gasoline engine. Air/fuel ratios therefore vary from 200:1 to approximately 20:1 as the engine moves from low loads to full load. The onset of excessive smoke prevents operation at conditions richer than 20 percent excess air, so diesel engines always operate with lean overall air/fuel ratios (Reference D-5).

In North American gasoline light-duty vehicles, NO_x is controlled by a combination of exhaust gas recirculation and catalytic exhaust aftertreatment. The rhodium catalyst used for NO_x reduction is only effective if little or no oxygen gas is present, accordingly a stoicheometric or rich mixture is needed. For this reason, this catalyst is not effective with diesel exhaust.

Table D-3. Incremental effect of emission control techniques applied to locomotive engines (Reference D-5)

EMD 12-645E3B

Condition	PM	HC	CO	NO_x
	g/bhp-hr			
Baseline (MBT injection timing, 210°F aftercooling)	0.15	0.29	0.81	10.46
4° injection retard, baseline aftercoolinmg	0.24	0.40	0.85	8.89
4° injection retard, 180°F aftercooling	0.23	0.38	0.92	7 98
4° injection retard, 180°F aftercooling, low sulfur-low aromatic fuel	0.19	0.33	1.02	7.18

GE 12-7FDL

Condition	PM	HC	CO	NO_x
	g/bhp-hr			
Baseline (MBT injection timing, 185°F aftercooling)	0.19	0.42	1.98	11.21
4° injection retard, baseline aftercooling	0.26	0.41	1.91	9.20
4° injection retard, 140°F aftercooling	0.28	0.46	2.04	8.68
4° injection retard, 140°F aftercooling, low sulfur-low aromatic fuel	0.20	0.36	2.04	7.60

Data are for laboratory engines installed at Southwest Research Institute. Emissions are measured over the AAR 3-mode duty cycle.

Catalytic NO_x reduction in diesel exhaust is achievable by adding reducing agents such as ammonia or urea to the exhaust gas stream, and flowing the mixture over suitable catalysts. This is the basis of selective catalytic reduction (SCR) systems and the RAPRENOx system, which are marketed commercially for NO_x reduction in stationary power generators. SCR has been demonstrated in some low-powered German locomotives. The usefulness of these techniques for North American freight locomotives is limited by the following constraints:

- The apparatus and the stored reducing agent take up a fair amount of space, and surprisingly little unoccupied space is available in a locomotive.

- The apparatus is complex and requires regular maintenance to remain reliable.

- Ammonia is toxic and presents a safety hazard if accidentally released.

Certain zeolite catalysts can reduce NO_x to N_2 and O_2, even in the presence of oxygen gas. These and other lean NO_x-reducing catalysts are currently being researched at the Southwest Research Institute and other institutions. It is too early to tell if this effort will result in a practical NO_x converter for diesel engines in the near future.

D.4 ALTERNATIVE FUELS

Alternative fuels have demonstrated the capability for lower NO_x and PM rates than those of conventional diesel engines. Fuels with potential applicability to locomotives include liquefied natural gas (LNG) and diesel/water emulsions.

D.4.1 LNG Use in Locomotives

Caterpillar Corporation has substantial expertise in natural gas fueling of medium speed engines and offers natural gas fueling as an option in its large stationary generator set engines. In the early 1990s, Caterpillar and the Morrison-Knudsen Corporation co-operated in the development of an LNG-fueled switcher locomotive, the MK1200. The MK 1200G is powered by a CAT G3516 operating on LNG via spark ignition of lean homogeneous gas/air mixtures. This engine features very low NO_x emissions (full load NO_x rates of approximately 1.5 g/bhp-hr), at the price of substantially lower fuel utilization efficiency than diesel baseline. Two MK 1200s are currently operated by Union Pacific in Los Angeles. Fuel storage for the MK 1200 is provided by three interconnected on-board LNG tanks, mounted in the frame. This arrangement provides sufficient fuel storage for the switcher's low engine load and limited operating radius.

Analyses of LNG for freight line haul application have generally led to the conclusion that a tender[7] is needed to store enough fuel for an adequate operating range between fuel fills. Approximately twice the volume of LNG is needed for the same energy storage as a volume of diesel fuel. Given the high cost of installing LNG storage and dispensing facilities, a tender is needed to give reasonably long operating ranges between fueling facilities. In the early 1990s, Burlington Northern developed a 30,000 gallon LNG tender which supplied fuel to a two-unit consist of LNG locomotives. The LNG locomotives powered unit coal trains operating between Wyoming and Minnesota. The locomotives were diesel EMD SD 40-2s, converted to LNG using LNG fumigation with diesel-pilot ignition. The LNG fuel system was developed and installed by Energy Conversion, Inc., of Tacoma, Washington. To prevent combustion knock in the natural gas/air mixture, the compression ratio was decreased substantially from that of the original EMD

[7] "Tender" refers to a rail car, separate from the locomotive(s), used to store locomotive fuel.

645 diesel engine. This contributed to the LNG locomotives having considerably higher fuel consumption rates than the original diesel configuration.

Subsequently, in 1993, the GasRail USA cooperative industry research program was established to demonstrate emission reductions by LNG fueling in EMD-710 locomotive engines. The project is being conducted and managed by Southwest Research Institute. The goal is a 75-percent reduction in NO_x emissions while retaining diesel-equivalent fuel efficiency. Several LNG combustion systems, including two spark-ignited systems and four that used a diesel pilot as an ignition source, were evaluated for their ability to provide low NO_x emissions and high thermal efficiency.

Considerations of performance, durability, conversion cost, and ease of integration led GasRail project engineers to select the Late-Cycle High Injection Pressure (LaCHIP) combustion system. The LaCHIP system involves the direct injection of natural gas at pressures exceeding 3,500 psi late in the compression cycle. A small quantity of diesel fuel is injected just before natural gas injection to provide a robust ignition source.

While improvements to the LaCHIP system continue, reductions in NO_x emissions from the diesel baseline now exceed 73 percent. Thermal efficiency closely meets levels recorded with 100-percent diesel fuel. Once the design is complete, an EMD F59PHI passenger locomotive will be retrofitted with the LaCHIP combustion system and then will be demonstrated in revenue service. The locomotive, owned by the Southern California Regional Rail Authority, is scheduled to enter commuter service in the Los Angeles area in late 1997 (Reference D-6).

While LNG shows promise as a low emission locomotive fuel, engine designs are still far from being mature enough for conventional freight service. To our knowledge, no locomotive manufacturer is planning to commercialize LNG fueled locomotives for freight line-haul or passenger train service. Once the GasRail USA engine design is completed, the locomotive manufacturer would need to conduct extensive durability testing to support a decision to offer the engine commercially. The railroad purchasing LNG locomotives would have to make expensive investments in tender cars and fueling facilities to support their operation. Major LNG fueling facilities normally require at least two years to permit and construct. Given the immaturity of LNG locomotive technology, and the costs and lead time to construct LNG fueling facilities, conversion to LNG is not a feasible emission mitigation option for the UP/SP merger.

D.4.2 Diesel Fuel/Water Emulsions

Researchers have extensively investigated the performance of fuel/water emulsions in laboratory diesel engines. The emulsions are formed by adding surfactants and mechanically mixing the fuel and water. The emulsion is metered in the engine using standard diesel fuel system components. The water in the emulsion cools the combustion process, and very effectively inhibits the formation of NO_x. The reduction in combustion temperature, and the formation of steam from the emulsion during combustion also leads to improved fuel efficiency, compared to baseline diesel fuel. The principal drawback with emulsions is that they are usually unstable. Left stored in a tank, the emulsion tends to revert to separate fuel and water phases. The need to prepare emulsions immediately prior to their injection into the engine has presented the greatest practical barrier to their use in vehicles.

A55 Corporation, working in co-operation with Caterpillar Corporation, has recently been promoting naphtha/water and diesel/water emulsions as heavy-duty engine fuel. The company has developed proprietary surfactant packages and blending equipment for making the emulsions from diesel fuel at existing fueling facilities. The equipment can blend and dispense emulsion at rates up to 50 gallons per minute. The 30 percent water-in-fuel emulsion reportedly remains stable for as long as two weeks. Emission and performance tests have documented 50-percent reductions in NO_x in emission controlled automotive diesel engines, accompanied by *reductions* in PM and brake-specific fuel consumption. A55 Corporation has performed durability testing in a CAT 3406 generator-set operating at 200 kW for 10,000 hours. A tear-down analysis revealed no unusual wear (Reference D-7).

The reported attributes of the A55 fuels could make them promising low emission locomotive fuels. Their suitability needs to be verified in locomotive demonstrations: none have been conducted to date. Given the 30-percent dilution of fuel by water, larger fuel tanks and higher-rate fuel injectors would be needed to maintain undiminished locomotive range and power. The emulsion would also have to demonstrate the ability to remain stable in the locomotive fuel tank over the hold times encountered in freight drag service. If their suitability for freight locomotives were verified through a rigorous development and demonstration program, the A55 fuels might prove to be useful for mitigating locomotive emissions in Wichita.

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Appendix K Noise and Vibration

Appendix K

Acentech Report No. 185

UNION PACIFIC/SOUTHERN PACIFIC RAILROAD MERGER MITIGATION STUDY

NOISE ANALYSIS
WICHITA, KANSAS

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CONTENTS

Appendix K
NOISE AND VIBRATION

Section 1: Noise Study Description

This study presents an assessment and description of mitigation options to address merger-related noise impacts along the existing Union Pacific corridor through Wichita, Kansas. Although UP recently indicated through verified statements that the post-merger increases in rail traffic will amount to less than the Board analysis threshold of eight trains per day, the revised traffic plan still exceeds the 100 percent increase in annual gross ton miles which is also a Board threshold for environmental analysis (See Section 4.2 of this appendix). Consequently, the SEA study team initiated this study in Wichita and Sedgwick County to 1) identify and quantify noise impacts including train horn noise, wheel/rail noise, and diesel locomotive noise and 2) identify and evaluate potential mitigation measures.

Section 2: Study Area

The study area includes sensitive receptors (See Section 4.2 of this appendix) along the existing UP rail corridor in Sedgwick County that includes Haysville and Kechi, Kansas and is shown in Figure 2.1 of this appendix.

In the vicinity of grade crossings, the area of train horn noise impact can extend as far as approximately 400 feet from the track into the adjacent community, while wheel/rail noise impacts typically extend up to 80 feet from the track. These impact distances depend on a number of factors, including train speed and the number of trains per day.

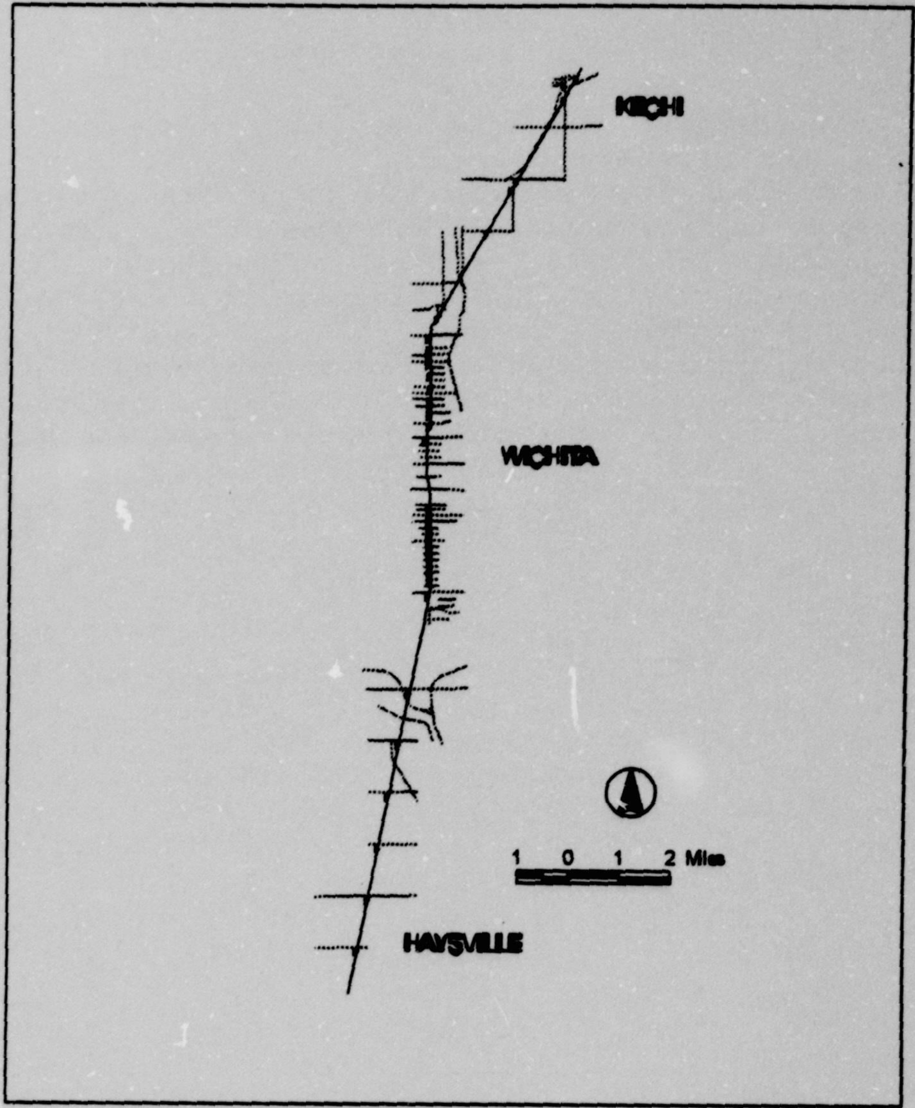

Figure 2.1 Wichita Study Area

Section 3: Railroad Operations

The UP/SP Merger Environmental Assessment (EA) reported that the increased through train movements on the Lost Springs-Wichita rail line will produce corresponding increases in locomotive exhaust noise and horn, engine, and wheel/rail noise. In addition to through trains, other train activity in Wichita includes local and yard train movements. This study includes the noise effects of all of these train movements.

Section 4: Methodology

The study team developed noise contours for both pre-merger conditions and post-merger conditions without further mitigation by using a computer model designed for this study. The computer model was based on noise measurements conducted in Wichita, as described below in Section 4.3. Noise contours were incorporated into a geographic information system (GIS) to provide detailed information regarding noise-affected land uses (see Section 4.6 of this appendix).

4.1 Noise Descriptors

The noise descriptor used for this study is the day-night average sound level (L_{dn}), which is the time-average of the A-weighted noise levels obtained over a 24-hour period. The average includes a 10 dB upward adjustment added to the nighttime levels (10:00 P.M. to 7:00 A.M.) to account for increased sensitivity to nighttime noise events. The glossary at the end of this appendix and Attachment B of this appendix present additional information regarding various measures of noise.

4.2 Noise Impact Criteria

The Environmental Assessment and Post Environmental Assessment identified sensitive receptors along the proposed post-merger UP/SP corridor through Wichita requiring noise analysis. The assessment was performed to identify noise-sensitive receptors where the change in operations could result in a noise exposure increase that would meet or exceed the Board thresholds for required noise analysis (49 CFR 1105.7(e)(6)).

The Board environmental rules in 49 CFR 1105.7(e)(6) provide that where train traffic exceeds the analysis thresholds, noise level impact analysis may be warranted. These thresholds are shown below in Table 4.2.1.

Table 4.2.1 Surface Transportation Board's Thresholds For Noise Impact Analysis

Activity Site	Noise Threshold
Rail Line Segment	Increase of 8 trains per day or 100% increase in annual gross ton miles
Rail Yards	Increase of 100% in carload activity per day
Intermodal facilities	Increase of 50 trucks per day or 10% increase in average daily traffic volume on any affected road segment

A noise impact requires analysis under the Board's environmental rules when either of the following occurs:

- Noise levels increase by three dBA or more, as measured by the day-night average sound level (L_{dn}) or

- An increase to an L_{dn} of 65 dBA or greater.

These criteria apply to noise-sensitive receptors (e.g., residences, schools, churches, libraries, hospitals, retirement communities, and nursing homes) that are in the area where the Board thresholds will be exceeded.

The study team analyzed those areas where the projected increase in train volume or change in train mix would be expected to cause: (1) more than a marginal change in noise exposure or (2) an increase in the number of noise sensitive receptors within the 65 dBA L_{dn} contour. For this study, any increase in L_{dn} of less than 2.5 dBA was considered insignificant.

A three dBA increase in L_{dn} normally requires a 100 percent increase in rail traffic, different equipment, or a shift of daytime operations to night hours.

4.3 Noise Measurements

The study team monitored train noise in Wichita during the week of March 17, 1997 to verify and refine the assessment of pre-merger noise conditions and to obtain a basis for modeling post-merger conditions. Pre-merger noise levels estimated in the EA and Post EA, were based on typical train horn noise measurements. The noise measurements in this mitigation study take into account site-specific sound issues, such as actual train horn equipment, shielding due to buildings, ground absorption, and the variability of train horn sounding sequences. The EA and Post EA analyses relied on estimates of these same effects.

Measurements were made of the ambient noise (i.e., the noise environment without trains) and of noise associated with train passages. Train passage measurements were made at six locations at two distances along a line extending perpendicularly from the tracks in order to characterize the site-specific sound issues described above. The locations were chosen to be representative of suburban areas (with some building shielding), grade-crossings (horn noise), and locations with no crossing (no horn noise). Train noise data for these conditions were deemed to be sufficient to characterize the entire study area and to quantify how train noise decreases with distance, shielding, and ground effects. The train noise measurement locations are identified below in Table 4.3.1.

Table 4.3.1 Noise Measurement Locations

Location	Type	Nominal Measurement Distances from Tracks (feet)
1. 71st Street South (Haysville)	Suburban grade crossing-with some shielding	100 & 200
2. 59th Street South and Southern	No horns	50 & 100
3. 53rd Street South	No horns	75 & 150
4. Pawnee	Suburban grade crossing-with some shielding	100 & 200
5. Osie	Urban/industrial grade crossing-with some shielding	100 & 200
6. 61st Street North (Kechi)	Suburban grade crossing-no shielding	100 & 200

Single-event sound exposure level (SEL) data for each train noise event were used to determine how train noise decreases with distance for each of the locations. The SEL permits comparison of the noise from events of different durations and is useful in this study since it takes the propagation of sound from the train to the measurement position for the entire train noise event, not just for the loudest portion of the noise event.

The rates of decrease of noise with distance calculated for each location identified in Table 4.3.1 of this appendix for every measured train noise event were used to determine the distance from the tracks to the 65 dB L_{dn} contour.

4.4 Noise Projections

Using the results of the noise measurements and analysis presented in Section 4.3 of this appendix, noise projections were made for both pre-merger conditions and post-merger conditions along the entire rail corridor. Since the number and type of rail operations for both the pre-merger and the post-merger vary considerably along the corridor, the resulting noise impacts also vary along the corridor. Table 4.4.1 of this appendix shows the results of this analysis for each grade crossing. Specifically, this analysis shows the distance from the track to the pre-merger and post-merger 65 dBA L_{dn} noise contour at each grade crossing.

The results of the noise projections are shown graphically in the figures in Attachment A of this appendix. These noise contour maps show the pre-merger and post-merger noise contours and affected noise-sensitive properties (parcels).

Table 4.4.1 Pre- and Post-Merger Distances to 65 dB Ldn Contour

UPSP WICHITA				PRE-MERGER									POST-MERGER		
	Day	Night								Day	Night				
Through Trains	55%	45%							Through Trains	54%	46%				
Local	50%	50%							Local	50%	50%				
Yard	63%	38%						Horn	Yard	63%	38%				Horn
								Average							Average
						Total	Total	Distance to		Post-Merger			Total	Total	Distance to
Street	Milepost	Through	Local	Yard	Total	Day	Night	65 dB Ldn (ft)	Through	Local	Yard	Total	Day	Night	65 dB Ldn (ft)
Greenwich		3.6	2	0	5.6	3.0	2.6	239	9	2	0	11	5.8	5.2	329
101st N		3.6	2	0	5.6	3.0	2.6	239	9	2	0	11	5.8	5.2	329
61st N		3.6	2	1	6.6	3.6	3.0	255	9	2	1	12	6.4	5.6	341
Oliver		3.6	2	1	6.6	3.6	3.0	255	9	2	1	12	6.4	5.6	341
45th N		3.6	2	1	6.6	3.6	3.0	255	9	2	1	12	6.4	5.6	341
Hillside		3.6	2	1	6.6	3.6	3.0	255	9	2	1	12	6.4	5.6	341
37th St. N.		3.6	2	1	6.6	3.6	3.0	255	9	2	1	12	6.4	5.6	341
City St.		4	3	7	14	8.1	5.9	355	9.6	3	7	19.6	11.0	8.6	423
21st		4	3	7	14	8.1	5.9	355	9.6	3	7	19.6	11.0	8.6	423
19th		4	3	7	14	8.1	5.9	355	9.6	3	7	19.6	11.0	8.6	423
18th		4	3	7	14	8.1	5.9	355	9.6	3	7	19.6	11.0	8.6	423
17th		4	3	7	14	8.1	5.9	355	9.6	3	7	19.6	11.0	8.6	423
15th		4	3	7	14	8.1	5.9	355	9.6	3	7	19.6	11.0	8.6	423
13th		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
11th		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
10th		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
9th		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
Murdock		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
Central		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
Gilbert		4	3	3	10	5.6	4.4	307	9.6	3	3	15.6	8.5	7.1	384
Lincoln		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Bayley		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Zimmerly		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Boston		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Harry		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Osie		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Funston		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Skinner		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Mt. Vernon		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Clark		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Kinkaid		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
Pawnee		4	1	2	7	4.0	3.1	258	9.6	1	2	12.6	6.9	5.7	346
MacArthur		4.4	1	2	7.4	4.2	3.2	265	10	1	2	13	7.1	5.9	351
47th S		4.4	1	1	6.4	3.5	2.9	250	10	1	1	12	6.5	5.5	340
55th S		4.4	1	0	5.4	2.9	2.5	233	10	1	0	11	5.9	5.1	328
63rd		4.4	1	0	5.4	2.9	2.5	233	10	1	0	11	5.9	5.1	328
71st S/Grand		4.4	1	0	5.4	2.9	2.5	233	10	1	0	11	5.9	5.1	328
79th		4.4	1	0	5.4	2.9	2.5	233	10	1	0	11	5.9	5.1	328
103rd		4.4	1	0	5.4	2.9	2.5	233	10	1	0	11	5.9	5.1	328
Meridian		4.4	1	0	5.4	2.9	2.5	233	10	1	0	11	5.9	5.1	328

4.5 Noise Model

The noise model used to generate the results shown in Section 4.4 of this appendix incorporates the results of on-site noise measurements to characterize train horn, engine, and wheel/rail noise and sound propagation effects, including the rates at which the noise level decreases with distance away from the tracks. Using this model, the study team calculated the train noise levels at each location.

The noise model was constructed so that "what if" scenarios can be analyzed efficiently. For example, the model can be modified to generate noise contours for various mitigation options, such as increasing train speed or constructing grade separations.

4.6 Noise Impact Assessment

A geographic information system (GIS) was used to evaluate the noise impacts of various train operation scenarios including pre-merger, post-merger without further mitigation, and post-merger with grade-separations (i.e., under or overpasses). Noise contours for each scenario were overlaid on parcel-based GIS data provided by Sedgwick County. The GIS data includes actual property boundaries and detailed land-use information.

Table 4.6.1 below shows the results of an analysis done to determine the extent of noise impacts for post-merger conditions without further mitigation and improvements derived from increased train speeds and from constructing grade separations. This combination of mitigation options was selected for analysis primarily to address traffic congestion issues.

Table 4.6.1 Affected Noise-Sensitive Receptors

Condition	Number of Noise-Sensitive Receptors Exceeding L_{dn} 65d BA
Pre-merger	295
Post-merger w/o further mitigation	380
Increased train speeds	434
Pawnee grade separation and increased train speeds	410
Pawnee & Central grade separations and increased train speeds	409
Pawnee, Central and 13th Street North grade separations and increased train speeds	409
Pawnee, Central, 13th Street North, and 21st Street North and increased train speeds	409
Elevated trainway and increased train speeds	430

Although increased train speeds have no effect on train horn noise impacts, they do affect wheel/rail noise impacts since wheel/rail noise increases with increased train speed. Table 4.6.1 of this appendix shows that the Pawnee grade separation reduces the number of affected receptors by 24 because horn noise would be eliminated at that location. Adding the Central grade separation reduces the number of affected receptors by only one more because there is only one noise-sensitive location in the vicinity. Adding grade separations at 13th Street North and 21st Street North has no effect on noise impacts. An elevated trainway has less benefit than the grade separations analyzed because in this option Pawnee would remain an at-grade crossing.

4.7 Vibration

Ground-borne vibration can be a concern for nearby neighbors of a railroad line, although it is not as common an environmental problem as noise. The effects of ground-borne vibration include movement of building floors, rattling of windows, and shaking of items on shelves or hanging from walls. In some extreme cases, vibration can cause cosmetic or structural damage to buildings.

The train wheels rolling on the rails create vibration energy that is transmitted through the track support system into the ground. The amount of energy that is transmitted is dependent upon how smooth the wheels and rails are, on the vehicle suspension system, and on the track support system. The vibration of the track support excites the adjacent ground, resulting in vibrations that propagate through the soil and rock to the foundations of the nearby buildings. Ground-borne vibration is typically less annoying to people who are outdoors than to people in buildings.

4.7.1 Vibration Descriptors

One of the most common measures of vibration is the peak particle velocity (PPV), defined as the maximum instantaneous vibratory motion in any direction. PPV is often used in monitoring blasting vibration, since it is related to potential damages to building components. Another descriptor is the root-mean-square amplitude, which is the average of the squared amplitude and is often used as the basic descriptor for evaluating human response to ground-borne vibration.

4.7.2 Regulatory Setting

Although there has been limited research of human response to building vibration, the Federal Transit Administration and the U.S. Bureau of Mines offer guidelines for judging the acceptability of vibration related to railroad projects.

Federal Transit Administration (FTA) Guidelines: As shown in Table 4.7.3 below, the FTA vibration guidelines delineate impact thresholds based on land use and event frequency, stated in terms of root-mean-square ground-borne vibration velocity level (VdB). Although the impact thresholds are based on experience with rail transit systems, they can be applied to freight train vibrations.

Table 4.7.3 FTA Ground-Borne Vibration Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Criteria (VdB re 1 micro inch/sec)(RMS)	
	Frequent Events*	Infrequent Events**
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB	65 VdB
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB

* "Frequent Events" are more than 70 events per day.
** "Infrequent Events" are fewer than 70 events per day.

Bureau of Mines Guidelines: Researchers at the U.S. Bureau of Mines have identified a ground vibration peak particle velocity (PPV) of 2.0 in./sec (126 VdB re 1 micro in./sec) as a safe blasting limit to avoid major damage to residential structures. Lower levels are recommended to minimize complaints. They have also identified a ground vibration peak particle velocity (PPV) of 0.5 in./sec (114 VdB re 1 micro in./sec) as the approximate threshold for minor cosmetic damage to buildings.

4.7.3 Generalized Ground Surface Vibration Levels

Ground-borne vibration is a complex phenomenon that is difficult to model analytically and predict accurately. Most prediction procedures used for rail projects rely upon empirical data. Factors that influence vibration caused by railroad activity include vehicle speed and suspension, wheel and track type and condition, track support system, soil type, soil rock layering, depth to water table, and building construction type. Vibration velocity levels as a function of distance from the track for different types of rail systems have been assembled and can be used for general assessment.

Based on the FTA residential buildings guidelines (i.e., an 80 VdB limit for the locomotives and a 72 VdB limit for the cars) on generalized railroad surface vibration levels, generalized propagation characteristics, and an estimated train speed of 30 mph, a vibration impact distance of 120 feet from the track was estimated for freight operations. That is, residential buildings within 120 feet of the railroad track may be subject to vibration that exceed the FTA vibration impact criterion.

4.7.4 Summary of Vibration Impacts

It is highly unlikely that freight train activity would cause damage to buildings in Wichita. Ground-borne vibration levels expected from freight train activity are substantially below cosmetic damage criteria, and these are lower than structural damage criteria.

The FTA vibration criteria assess the impact of the maximum vibration level of a single train passby. Residential buildings within 120 feet of the railroad track may be subject to vibration that exceeds the FTA vibration criteria. However, the increase in number of trains from pre-merger to post-merger conditions will not change the maximum vibration levels along the rail corridor. Therefore, no additional residences will be impacted by vibration as a result of the merger, based on existing vibration criteria. In conclusion, estimated maximum ground-borne vibration levels from a single train passby at the nearest residences are below the cosmetic and structural damage criteria. Vibration levels from single train passby could exceed the human response impact criteria, but would equally apply to both pre-merger and post-merger operation conditions.

Section 5: Potential Mitigation Measures

Mitigation options include grade separations, building sound insulation treatments, local grade crossing warning devices (i.e., a horn sound source located at grade crossings), source noise controls (for wheel/rail and diesel engine noise), noise barriers, four-quadrant gates and quiet zones, median barriers and quiet zones, and train horn modifications. The following is a brief description of several of these mitigation options and evaluation of their effectiveness at mitigating noise impacts.

The basic criterion for evaluating effectiveness regarding noise is the number of noise-sensitive receptors that are affected as a result of implementing the mitigation option.

5.1 Grade Separations

Train horn noise at grade crossings could be eliminated by building grade separations (overpasses or underpasses). Table 5.1.1 below lists the number of affected noise receptors at each of thirteen grade crossings. Building grade separations at these crossings would eliminate horn-noise impacts to these receptors.

Table 5.1.1 Noise Impacts at Grade Crossings

Grade Crossing	Number of Affected Receptors
Pawnee	61
71st South	47
Kincaid	32
63rd South	31
Boston	26
Skinner	23
Mt. Vernon	23
Osie	21
Fundstrom	20
55th South	20
Clark	18
117th South	18
Harry	15
Total	355

5.2 Local Grade Crossing Warning Devices

The Federal Railroad Administration (FRA) and the Union Pacific Railroad have been assessing the viability of alternative local grade crossing warning devices, such as locating a horn or loudspeaker at the grade crossing. The benefit of such a device would be to limit the extent of the impact on affected communities. Currently, train horns are sounded a quarter of a mile from a grade crossing, resulting in noise exposure to residences in a fairly large area. Since the sole purpose of the horn is to warn motorists and others at the crossing, a device that delivers horn noise only to the area at or near the crossing is preferable.

The FRA has tested a prototype automated horn system (AHS) designed to increase the warning effectiveness at grade crossings while minimizing community noise impact. The system consists of a single electronic horn placed directly at a grade crossing and directed along approaching roadways. The AHS horn is quieter than a train-mounted horn. In addition, since the horn is located at the grade crossing, the size of the affected surrounding area is lessened. The directivity of the system results in sound levels that are higher directly in front of the horn and lower to the rear and the sides. Consequently, not only is the area of affected community reduced, but the horn is more effective because of its greater audibility to motorists further down the road.

Figures 5.2.1 and 5.2.2 below show the estimated 65 dB L_{dn} contour for the AHS at the Pawnee grade crossing and 71st Street compared with the contour for conventional horn noise. As can be seen from these figures, the AHS provides a substantial amount of noise reduction. If the AHS were used at all of the grade crossings listed in Table 5.1.1 above, the number of affected receptors would be reduced to 152 properties.

The approximate cost of an AHS installation at a grade crossing is $12,000 to $15,000. The range of costs depends on whether or not the road is two-lanes or a divided highway, features which affect the complexity of the installation. The cost assumes that the crossing is state-of-the-art with appropriate circuitry for the AHS.

Other considerations regarding the AHS include its effectiveness as a warning device in comparison with a conventional train horn. Section 5.9 of this appendix includes additional discussion regarding this issue.

5.3 Train Horn Modifications

Train horn types include the three-chime (i.e., three discrete tones) Leslie and five-chime Nathan. One of the Leslie horns, the RSL-3L-RF (used on the Union Pacific GE Dash-8 locomotive), is more efficient toward the sides and rear of the engine than the front. The sound level measured in front of the engine is approximately 6 dBA lower than that at the sides and 8 dBA lower than that measured at the rear. Therefore, in order to meet the FRA's requirement of 96 dBA measured at 100 feet in front of the engine, this particular horn produces 102 dBA at the sides and 104 dBA at the rear of the engine. Substantial mitigation might be achieved by assessment and modification of the horn designs. Because horn design modification would be a permanent part of the locomotive, this option would have system-wide benefits anywhere horn noise affects communities.

Table 5.3.1 below lists a variety of mitigation options and indicates the total number of noise-sensitive locations still affected by train noise if the option is in place. As shown in the table, some mitigation options such as speeding up trains, which is proposed to reduce motorist delay, may increase noise-related impacts.

Table 5.3.1 Mitigation Summary

	Number of properties/buildings affected	Change in relation to pre-merger conditions
Pre-merger	295	
Post-merger w/o further mitigation	380	85
Post-merger with the following mitigation options		
Speeding up trains	434	139
One grade separation and speeding up trains	410	115
Two grade separations and speeding up trains	409	114
Three grade separations and speeding up trains	409	114
Four grade separations and speeding up trains	409	114
Elevated Trainway	430	135

5.4 Source Noise Control

Source noise control refers to reduction of noise at the source. In the case of freight trains, source noise controls apply to wheel/rail and diesel engine noise. Wheel/rail noise can be reduced by wheel truing and rail grinding. Diesel engine noise may be reduced by improved exhaust silencer technology or active noise control.

Active noise control means adding loudspeaker-generated sound pressures to those from engine noise. The sound pressures cancel each other, resulting in greatly reduced noise. The Federal Railroad Administration (FRA) is currently conducting a study of the feasibility of active noise control for diesel locomotives.

Source noise controls could reduce the area of impact in regions where noise impact is not due to horn noise. However, since the impacts in these regions are very limited, source noise controls would have only a minor benefit for this project.

5.5 Sound Insulation for Buildings

Sound insulation refers to the noise attenuation characteristics of a building envelope which reduce the intrusion of outdoor noise into the building. Sound insulation treatments usually involve improving the noise insulation characteristics of windows, since windows are usually the weak acoustical link. Special acoustical windows or modifications to existing windows can provide up to 10 dBA increased noise reduction.

Nominal sound insulation treatment costs can range from $10,000 to $20,000 per dwelling unit, depending on air-conditioning costs. Attachment C to this appendix shows a list of affected properties and the estimated cost of sound insulation for each property. The total for this project amounts to $8,000,000.

5.6 Noise Barriers

Noise barriers such as noise walls are effective for reducing wheel/rail noise that reaches the community. They are less effective for the reducing impact of train horn noise, which is the main source of train-related noise impacts. Locations with impacts from wheel/rail noise stand to benefit most from the construction of noise barriers. Table 5.6.1 identifies such locations, the number of units which could be protected from noise at each location, and the cost of building those noise barriers.

Table 5.6.1 Noise Barrier Analysis

Location	Approximate Barrier Length (ft)	Estimated number of protected dwelling units	Approximate Cost
Greenway St. (north of Wassall St.)	900	6	$135,000
Between 44th and 43rd St. South	1400	8	$210,000
Turkle Avenue, Haysville	2600	32	$390,000

5.7 Four-Quadrant Gates and Quiet Zones and Median Barriers and Quiet Zones

The FRA currently is considering the use of four-quadrant gates or median barriers, both of which are designed to keep motorists from driving around the crossing gate arm as a train approaches. This approach could eliminate train horn noise (hence the term "quiet zone") at specific grade crossings.

Quiet zones are not practical in the central part of Wichita, where horn soundings from nearby adjacent railroad tracks would substantially reduce the effectiveness of the quiet zone. Quiet zones might be feasible at grade crossings south of Wichita, such as at 71st Street in Haysville. The associated costs would include those for upgrading the crossing to a four-quadrant crossing gate or those costs associated with installing median barriers.

Appendix K

GLOSSARY

A-weighted Sound Level (dBA) — The most commonly used measure of noise, expressed in "A-weighted" decibels (dBA), is a single-number measure of sound severity that accounts for the various frequency components in a way that corresponds to human hearing.

Day-Night Sound Level (L_{dn}) — One of the most widely accepted measures of cumulative noise exposure in residential areas. The Day-Night Sound Level (L_{dn}) is the A-weighted sound level, averaged over a 24-hour period, but with levels observed during the nighttime hours between 10 p.m. and 7 a.m., increased by 10 dBA to account for increased sensitivity at night.

decibel (dB) — A logarithmic scale compresses the range of sound pressures audible to the human ear over a range from 0 to 140, where 0 decibels represents sound pressure corresponding to the threshold of human hearing, and 140 decibels corresponds to a sound pressure at which pain occurs. Sound pressure levels that people hear are measured in decibels, much like distances are measured in feet or yards.

Noise — Any undesired sound or unwanted sound.

Peak Particle PPV Velocity (PPV) — The greatest instantaneous velocity, regardless of the direction of the motion. is often used in monitoring blasting vibration, since it has been related to potential damage in buildings.

RMS Vibration Velocity Level — The square-root of the squared magnitude vibration velocity; often used to describe average vibration magnitude. The RMS vibration velocity level is widely used as the basis for evaluating human response to ground-borne vibration, often given in velocity decibels (VdB).

Sound — A physical disturbance in a medium (e.g., air) that is capable of being detected by the human ear.

Sound Exposure Level (SEL) — A quantitative measure of the noise exposure produced by a given noise event. The sound exposure level (SEL) is equivalent in magnitude to a reference signal with a duration of one second. The SEL accounts for both the magnitude and duration of the noise event and can be used to calculate the contribution of specific events to the overall noise environment. The SEL is representative of the total sound energy produced by the event at an observation point; it indicates the constant sound level with one second duration that corresponds to the same total sound energy as the given event.

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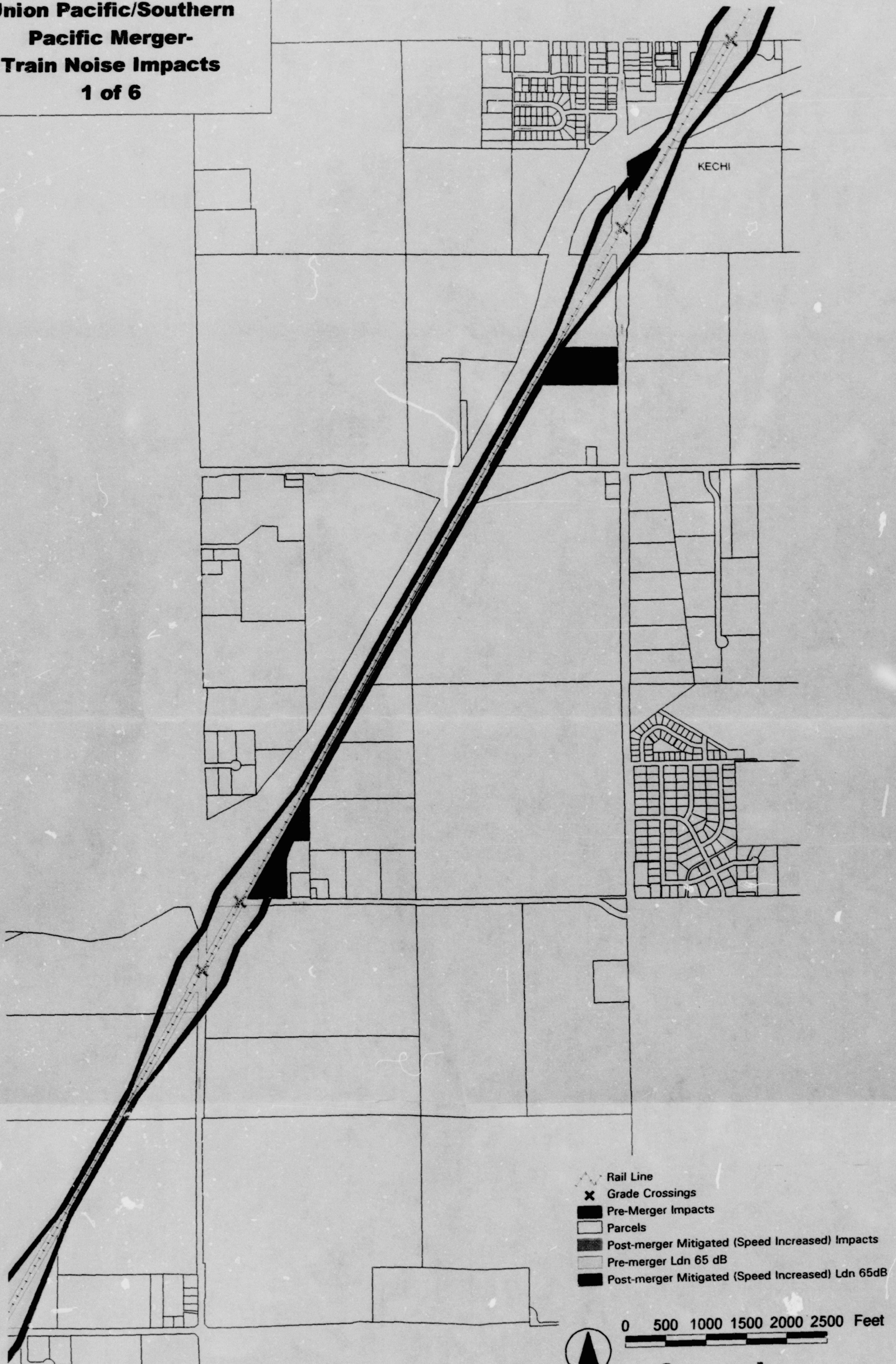
Transit Noise and Vibration Impact Assessment, Federal Transit Administration, April 1995

Teleconference with Cliff Shoemaker, Union Pacific Railroad, 7/7/97

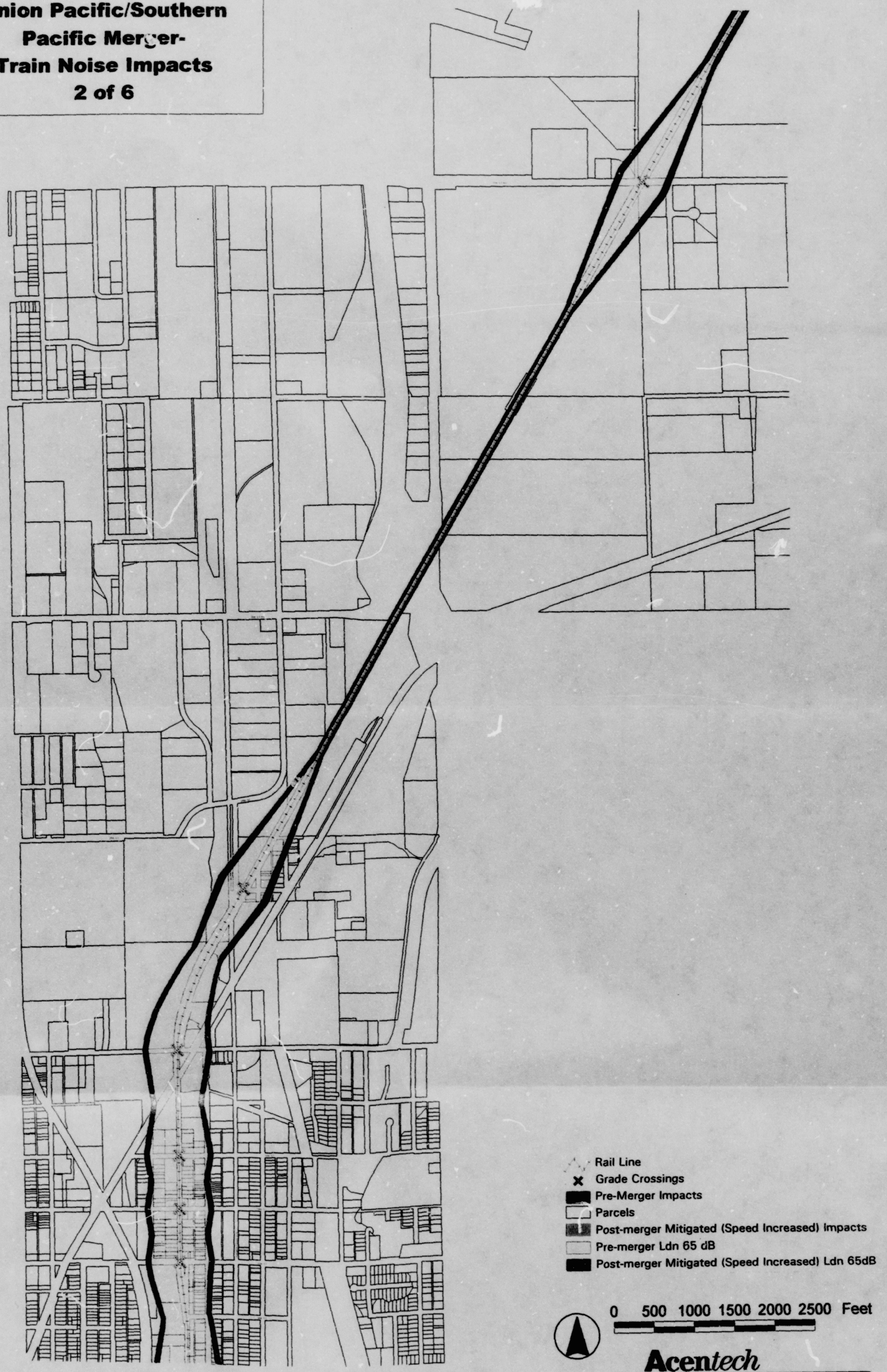
Teleconference with Andy Anderson, Railroad Consulting Service, 7/8/97

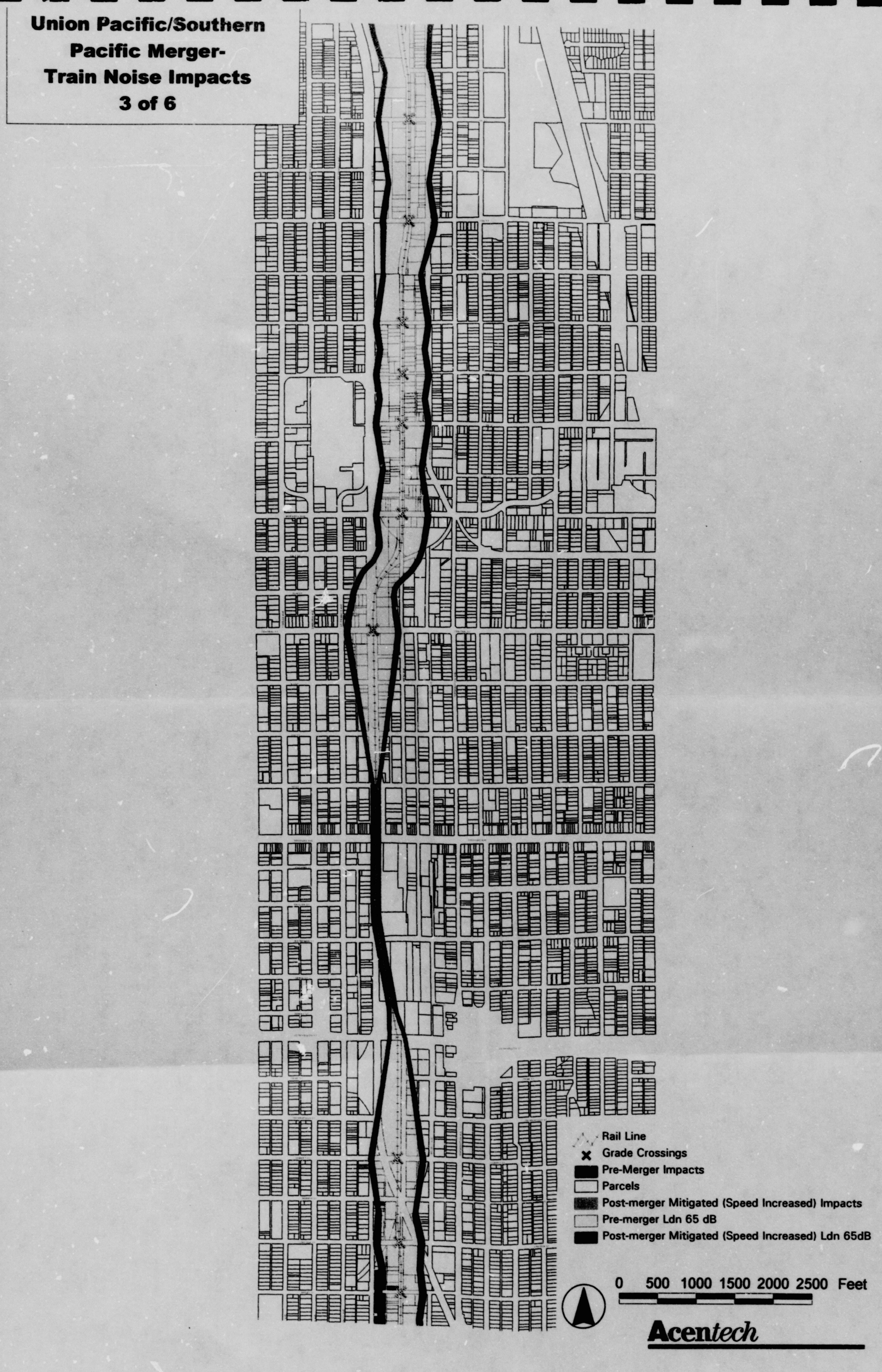
ATTACHMENT A: TRAIN NOISE IMPACTS

Union Pacific/Southern Pacific Merger- Train Noise Impacts 1 of 6



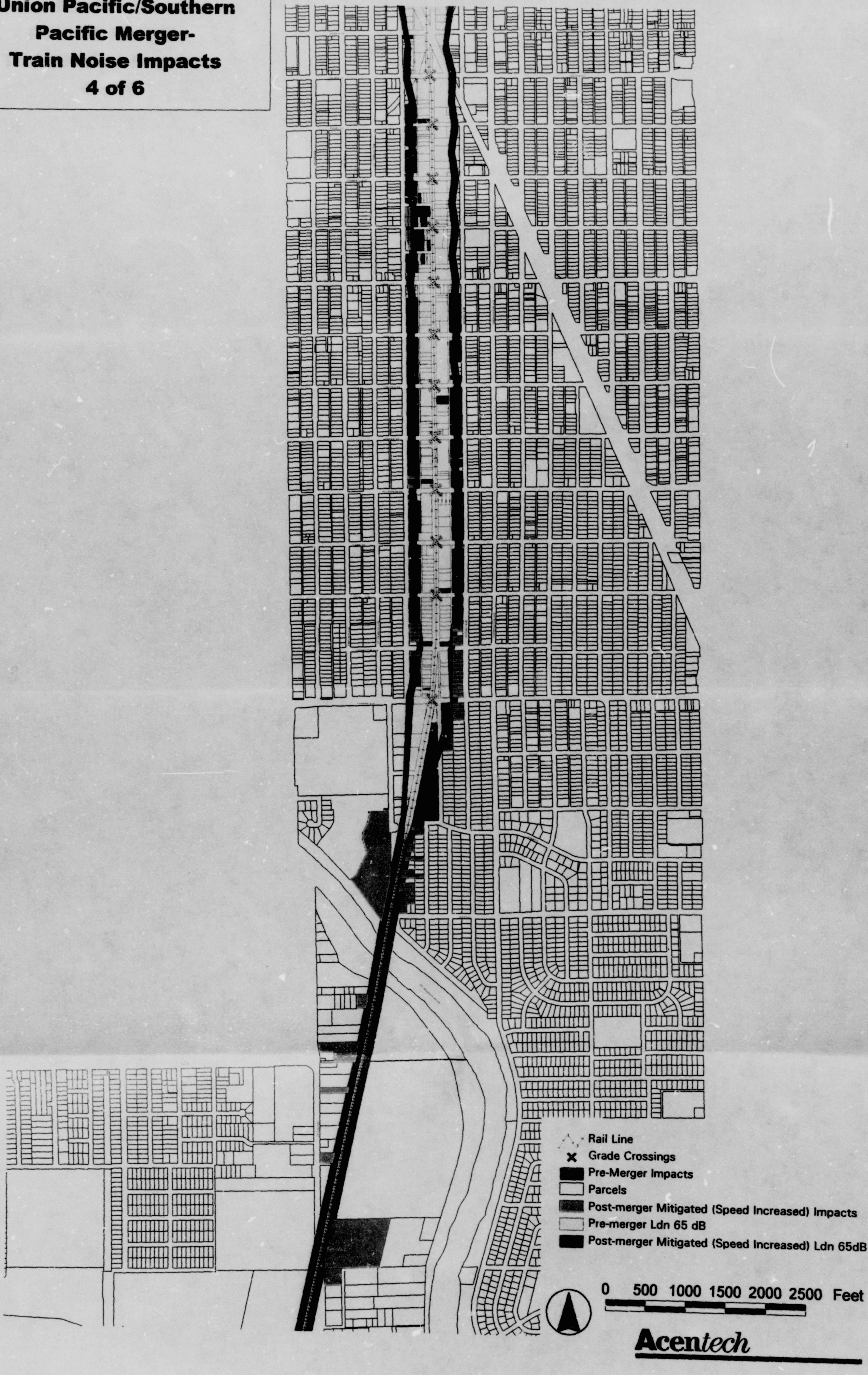
Union Pacific/Southern Pacific Merger-
Train Noise Impacts
2 of 6





Union Pacific/Southern
Pacific Merger-
Train Noise Impacts
3 of 6
Rail Line
Grade Crossings
Pre-Merger Impacts
Parcels
Post-merger Mitigated (Speed Increased) Impacts
Pre-merger Ldn 65 dB
Post-merger Mitigated (Speed Increased) Ldn 65dB
0 500 1000 1500 2000 2500 Feet
Acentech

Union Pacific/Southern Pacific Merger-
Train Noise Impacts
4 of 6



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Union Pacific/Southern Pacific Merger-
Train Noise Impacts
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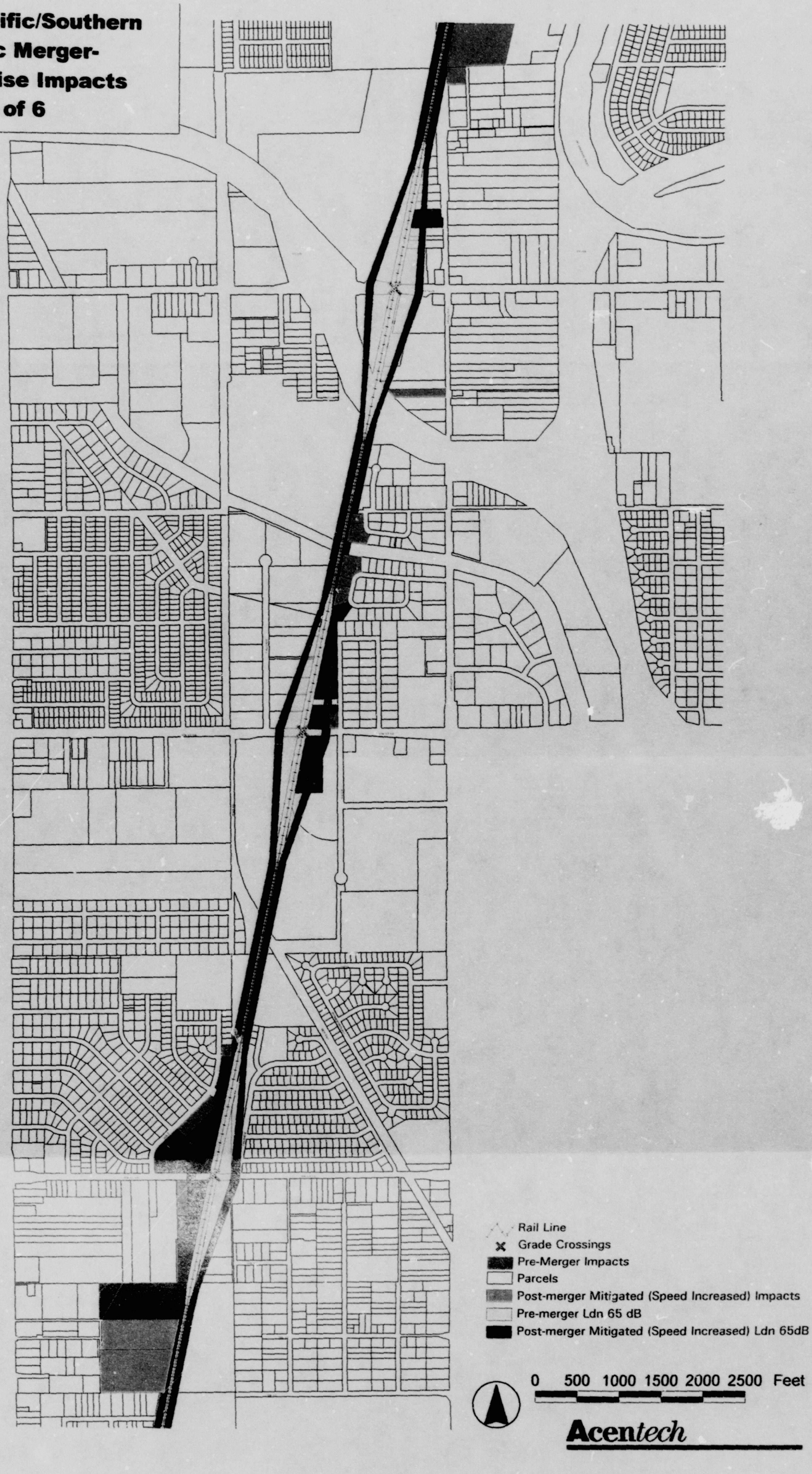

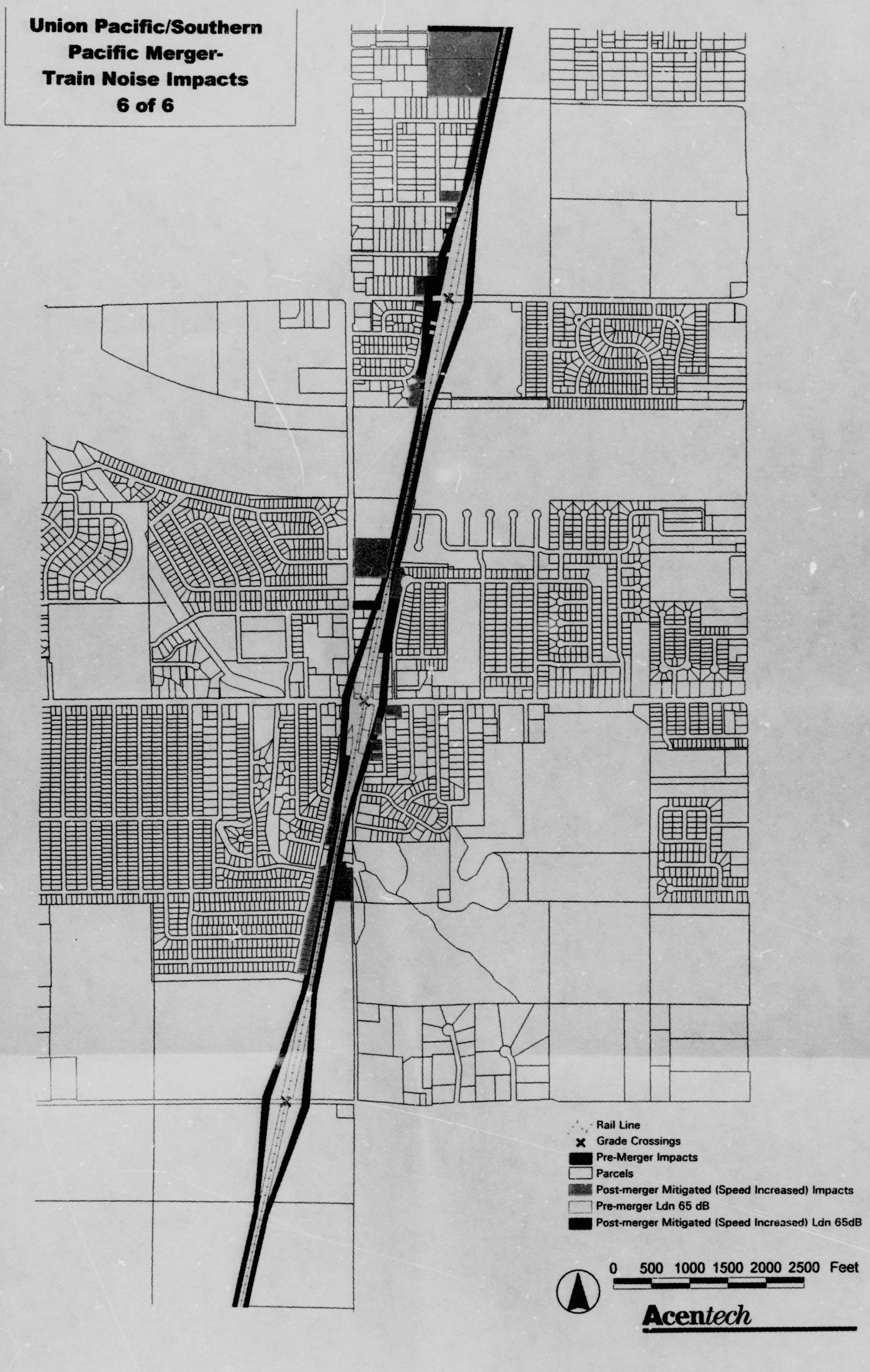
Union Pacific/Southern
Pacific Merger-
Train Noise Impacts
6 of 6
Rail Line
Grade Crossings
Pre-Merger Impacts
Parcels
Post-merger Mitigated (Speed Increased) Impacts
Pre-merger Ldn 65 dB
Post-merger Mitigated (Speed Increased) Ldn 65dB
0 500 1000 1500 2000 2500 Feet
Acentech

ATTACHMENT B: ABOUT NOISE

Noise is usually defined as sound that is undesirable because it interferes with speech communication and hearing or is otherwise annoying. The characteristics of sound include parameters such as amplitude, frequency, and duration.

Sound pressure levels can vary over an extremely large range of amplitudes. The decibel (dB) is the accepted standard unit for measuring the amplitude of sound because it accounts for these large variations in amplitude and reflects the way people perceive changes in sound amplitude.

Different sounds may have different frequency content. Frequency content of a sound refers to its tonal quality or pitch. When describing sound and its effect on humans, A-weighted (dBA) sound levels are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the noise signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. This filtering network has been established by the American National Standards Institute (ANSI). The A-weighted noise level has been found to correlate well with peoples' judgments of the noisiness of different sounds and has been used for many years as a measure of community noise.

Community noise levels usually change continuously during the day. However, community noise typically exhibits a daily, weekly, and yearly pattern. To compare noise levels over different time periods, several descriptors have been developed. One descriptor, the equivalent sound level (L_{eq}), is the equivalent steady-state A-weighted sound level that would contain the same acoustical energy as the time-varying A-weighted sound level during the same time interval. The hourly L_{eq} is often used to describe traffic noise.

Another descriptor for noise is the statistical A-weighted noise level exceeded in a given percentage of the time. For example, the L_{50} is the level exceeded 50 percent of the time and the L_{10} is the level exceeded 10 percent of the time.

The Single-Event Sound Exposure Level (SEL) is a noise descriptor that normalizes all of the sound energy of a noise event to a one second duration. The SEL provides a meaningful way to compare noise levels of two different noise events of different durations. The SEL is useful for calculating the drop-off rate in the case of train noise since it takes into account the propagation of sound from the train to the measurement position for the entire train noise event, not just for the loudest portion of the noise event. In addition, the SEL in conjunction with the number of daytime and nighttime train noise events can be used to directly calculate the L_{dn} (the day-night average noise level used for identification of impacts in this study).

The day-night average sound level (L_{dn}), was developed to evaluate the total daily community noise environment. The L_{dn} is the time average of all A-weighted levels for a 24-hour period with a 10 dB upward adjustment added to the nighttime levels (10:00 P.M. to 7:00 A.M.). This adjustment is an effort to account for the increased sensitivity to nighttime noise events. The L_{dn} noise metric has been adopted by Federal agencies including the Environmental Protection Agency, the Federal Transit Administration, the Federal Aviation Administration, and the Housing and Urban Development as the accepted unit for quantifying human annoyance to environmental noise.

When high noise levels are experienced inside or outside people's homes, as may occur from the passage of motor vehicles or the operation of mechanical equipment, a feeling of annoyance may result. These noise levels may also interfere with the performance of various activities such as conversation, TV watching, and sleeping. The degree to which there is annoyance and/or activity interference depends on the magnitude of the intruding noise level, the frequency with which it occurs and the time of day of occurrence. In response to the Noise Control Act of 1977, which directed the EPA to establish a recommended measure to describe community noise, the day-night average sound level (L_{dn}) was selected as the unit of measurement to be used to predict annoyance from noise exposure.

ATTACHMENT C: WICHITA BUILDING SOUND INSULATION COST ESTIMATE

Table 8.2 Wichita Building Sound Insulation Cost Estimate

UPSP MERGER MITIGATION STUDY
WICHITA-SOUND INSULATION COST ESTIMATE (ORDER-OF MAGNITUDE), 7/3/97
Administratively Confidential

Total Cost [illegible]

Assumptions: $20K per dwelling unit(s.c.), $5K per mobile home, $50K for churches

PARCELS_ID	NAME	PROP_ADDR		PROP_CITY	PROP_ZIP	LAND_USE #	Decription	Sound Insulation $
1718	SANTNER ELMO A & PHYLLIS M	00810 N ST FRANCIS	AVE	WICHITA		111	Single Family Residential	$20,000
1927	DAVISON WILLIAM C & ERNESTINE	00812 N ST FRANCIS	AVE	WICHITA		111	Single Family Residential	$20,000
846	KELSEY LORENA J	01102 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1205	FUGITT KATHELEEN N ETAL	01232 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1226	STEPHANS MARJORIE J	01234 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1248	RONK EARL P ETUX	01236 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1268	DARBYSHIRE MICHAEL A	01238 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1290	ENOCH DONALD K REVOC TRUST	00716 E BAYLEY		WICHITA	67211	111	Single Family Residential	$20,000
1291	KINDEL JOSEPH D & ELIZABETH	00712 E BAYLEY		WICHITA	67211	111	Single Family Residential	$20,000
1293	NGUYEN PHONG T & LAP T	01240 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1318	HART RENTALS INC	00708 E BAYLEY		WICHITA	67211	111	Single Family Residential	$20,000
1341	BURGE CARL E & JACKIE M	01308 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1360	WILSON EUGENE C JR & FELICIDAD	01310 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1383	PIERCE EARL N III & IMELDA	01316 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1408	PIERCE EARL N III ETUX	01322 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
1451	PIERCE EARL N III & IMELDA	01332 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1472	KANTOROWSKI FAY L & VALENTINE R	01338 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1493	MC INTOSH MELANIE	01342 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1517	MANNING T C & KAREN M	01344 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1535	AMERICAN HOUSING TRUST IV	01352 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1559	HUYNH JOHN T & THA KIM TRAN	01356 S SANTA FE	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1604	CHANCE WILLIAM F ETUX	01400 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
1620	CHANCE WILLIAM F ETUX	01408 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1691	GUERRERO EVA ETAL	00730 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1723	AMERICAN HOUSING TRUST IV	01430 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1753	MOORE MARY L	00729 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1754	BLICK ARTHUR N JR & RITA D WHITE	00723 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1755	CAIRE CONCEPTION R	00721 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1757	LAMAR RONALD D & PAMELA K	00719 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1758	PASSELL MARVIN H & THOMAS O	00713 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1759	MILLER JAMES C & LANE W COLE	00711 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1760	ROSSITER IVAN L & ELIZABETH G	00705 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1761	ROSSITER IVAN L & ELIZABETH G	00701 E ANTLER		WICHITA	67211	111	Single Family Residential	$20,000
1824	ROSSITER IVAN L & ELIZABETH G	00726 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1825	ROSSITER IVAN L & ELIZABETH G	00722 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1827	ROSSITER IVAN L ETUX	00000				111	Single Family Residential	$20,000
1828	ROSSITER IVAN L ETUX	00712 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1831	ROSSITER I L	00702 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1886	ALFARO ROBERT J	00723 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1888	DAVIS MICHAEL E ETUX	00719 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1889	LUALLEN DON R ETAL	00715 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1891	LUALLEN DONALD R ETUX	00711 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1894	COMBS SARAH A	00701 E BOSTON	ST	WICHITA	67211	111	Single Family Residential	$20,000
1953	HERNANDEZ FABIAN & EUGENIA	00720 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000
1956	KIRK DARREL R ETUX	00718 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000
1957	WELLER GERALD L & LYNDA L	00716 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000
1958	THOMPSON BOB G	00714 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000
1961	SANCHEZ GILBERT & MARIA L	00712 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000
1963	WOOLEN SHIRLEY J & DAVID E	00704 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000
2063	VANDERFORD CORWIN M	01532 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
2075	YORK BRUCE L & KATHY J	01536 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
2095	SMITH CECIL H & ERNEST F	00719 E COTTAGE GROVE		WICHITA		111	Single Family Residential	$20,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

2096	WILLS JAMES RAYMOND ETUX	01540 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
2115	SHERMAN EVA	01542 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
69	GRAMM MARIE E & RUTH B NELSON	01609 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
107	COLE CHARLIE J	01619 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
116	STROBEL CHARLES B ETAL	01614 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
121	ATWATER STEPHEN D & DEBRA S	01621 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
150	VONCANNON PAUL L & JUDITH M	01618 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
190	MILLER KENNETH L & LETHA	01620 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
202	THORNBURG JIM & NORMA K PENNE	01622 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
208	HESS ALETHA F	01639 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
225	GORDON DAVID L & WILMA P	01641 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
243	DILL BETTY L ETAL	01634 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
252	THACKER ROSEMARY E ETAL	01645 S MOSLEY		WICHITA	67211	111	Single Family Residential	$20,000
286	THACKER ROSEMARY E	01653 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
291	JOHNSON NORMAN W & PATRICIA A	01648 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
296	DREES ETHEL C	01659 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
299	BROWN BETTIE L	01658 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
354	BOUCHER ELIZABETH S ETAL	01707 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
379	GOSVENER BENNY J & DONNA K	01710 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
390	PALMER IRA G JR ETUX	01711 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
400	WYNN ELLEN	01717 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
415	ALLEN STANLEY E ETAL	01714 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
432	CAUSEY MARIA J	01719 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
452	DYE WALTER J	01722 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
460	MARSALIS JAMES W & BECKY J	01723 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
485	JONES LYLE D & BETTY L	01726 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
512	WENKE WILLIAM	01732 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
536	DICKEY JACK OTTO	01742 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
563	TREECE FRANCES M	01746 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
573	WATTS ELDON H	01755 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
588	UNRUH GARY B & LINDA K	01752 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
604	NETTLETON JAMES F ETUX	01758 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
634	BIGGS T G ETUX	01801 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
641	OEHLERT WILLIAM L ETUX	01802 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
647	ANDERSON JOHNNY H & DORA L TRU	01805 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
674	HERBERT DON W & EVA	01808 S SANTA FE	AVE	WICHITA	67211	111	Single Family Residential	$20,000
680	FRIEND JAMES J	01815 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
694	WHITE ALICE B	01814 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
723	COONS WM C ETUX	01822 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
732	BUCK ROBERT E	01825 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
754	STANKE GUENTER ERNST ETUX	01831 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
761	PERRYMAN HENRY	01826 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
775	KORBER WILLIAM L ETUX	01835 S MOSLEY	ST	WICHITA	67211	111	Single Family Residential	$20,000
778	GABEL CRAIG A	01834 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
799	POISTER MARY E ETAL	01839 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
808	DOWNING JIMMIE L ETUX	01840 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
822	POISTER MARY E ETAL	01845 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
840	BOURQUE LAURENCE W ETUX	01846 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
849	TENNIS HELEN	01850 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
857	PRICE NORMAN J JR ETUX	01849 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
873	LAUGHLIN THOMAS W	01859 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
889	ABERCROMBIE SCOTT L	01855 S MOSLEY	ST	WICHITA	67211	111	Single Family Residential	$20,000
894	DICKINSON DAVID S	01858 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
918	SCOTT TIMOTHY L & DONNA J	01903 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
929	KEMPTON CALVIN E ETUX	01902 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
941	EDWARDS TOMMY D & KATHY D	01909 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
948	MULLEN MAXIE D & CYNTHIA	01908 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
969	HEIN RICHARD THOMAS	01911 S MOSLEY		WICHITA		111	Single Family Residential	$20,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

977	MAZUREK ANDREW S	01912 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1006	STEUBER MARLENE C	01921 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1010	RAZEY TIMOTHY T & TAMMY B REV T	01916 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1035	VREELAND GARY F & KIMBERLY L	01920 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1042	WHINERY HARRY R ETUX	01927 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1045	HARRISON JAMES E JR	01928 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1055	REED F G ETUX	01932 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1065	FRIEND WAYLAND O & GRACE A	01935 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1093	LOVE JACK LEON ETUX	01940 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1102	MOORE JAMES L & KATHRYN A	01943 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1141	BERNHARDT PERRY N & JUDI L	01949 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1147	SOERRIES ALEX J LIV TR	00000				111	Single Family Residential	$20,000
1148	VAN DAM HENRI L	01946 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1154	JORDAN JAMES E ETUX	01953 S MOSLEY		WICHITA	67211	111	Single Family Residential	$20,000
1169	BLANKE STAR E	01948 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
1172	LINDEMAN LENA & LINDA L L-HOHLE	01957 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1177	TURNER KENNETH G & JOE K	00710 E MT VERNON	ST	WICHITA		111	Single Family Residential	$20,000
1180	POULTER PEGGY	01958 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1207	HOWLAND OSCAR L ETUX	02001 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1241	GOTTSCHALK WENDELIN & MONICA	02011 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1253	NICHOLAS NORA B	02010 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1265	PROTHRO MARVIN F & PATRICIA K	02017 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1306	ELLIS G LORENE	02020 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1313	BETZEN RUSELL A	02021 S MOSLEY	ST	WICHITA	67211	111	Single Family Residential	$20,000
1326	SIMPSON GREG R & TRACI L	02027 S MOSLEY		WICHITA		111	Single Family Residential	$20,000
1331	STAFFORD CAROLE ETAL	02026 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1356	ANDERSON DENNIS C & MARION A	02028 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
1368	REIZ KEVIN A	02033 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1391	LEDERHOO ANTHONY M ETAL	02035 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1409	MORRISON KENNETH H & NANCY A	02037 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1416	DWYER VALERIE L	02040 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1442	MORRISON KENNETH H & NANCY A	02039 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1463	HITE MYRON L ETUX	02046 S SANTA FE		WICHITA	67211	111	Single Family Residential	$20,000
1484	ESHOM OPAL O	02050 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1534	JOHNSON SHERYL F ETUX	02102 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1539	GRIFFITH DELBERT & MARJORIE	02107 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1541	GORDON DAVID L & WILMA P	02108 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1565	SATTERFIELD LONNIE & CHRIS	02120 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1576	ANDERSON MARION E JR	02111 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1589	REDDICK SANDRA A	02117 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1614	MARTINSON GAIL	02121 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1618	COURTER DEWEY E JR	02124 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1631	RAY DONALD BRYAN ETUX	02128 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1639	WIEBE MARK R	02125 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1664	SCRIVEN JAMES E	02135 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1672	MONGE JOSE P & CLARA K	02132 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1691	COX SUSIE	02141 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1698	LAMAR RONALD D & PAMELA K	02136 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
1723	STEWART SUE D	02143 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1727	RAMSEY JUDSON H ETAL	02140 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1769	HAMBY NITA C	02148 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1767	BAILE STEVEN E	02159 S MOSLEY		WICHITA	67211	111	Single Family Residential	$20,000
1800	HURLEY DEAN & TERRY	02156 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1826	SWEARINGEN MARY L	02201 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1831	WALSH JACQUELINE R ETAL	00701 E KINKAID	AVE	WICHITA		111	Single Family Residential	$20,000
1876	SCHRAMM GERALDINE	02206 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1882	PHILLIPS TREVA A	02213 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1902	ALCORN CHALMER H SR	02212 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

1908	WILLIAMS JOHNNIE D & DONNA L	02215 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1911	WEIDNER SANDRA F ETAL	02216 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1940	PAGE MICHAEL H	02222 S SANTA FE	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1952	SCHROEDER MARK F & SHARON L	02219 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
1962	PASCAL STEVEN D	02226 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
1978	JAMB ASSOCIATES	02223 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
1994	ROWE KERRY S	02230 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2023	LANG VICKI L	02235 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2026	FARMER EDITH M	02238 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2036	MC FERRIN JERRY D	02241 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2070	GOERZEN MARVIN K ETUX	02242 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2108	OMSTEAD FRANK J ETUX	02251 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2110	HUNLEY RAY	02252 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2143	MC DONALD SALLIE DARLENE	02255 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2145	OEDING LAWRENCE I	00804 E BLAKE		WICHITA	67211	111	Single Family Residential	$20,000
2148	OEDING LAWRENCE I	00802 E BLAKE		WICHITA	67211	111	Single Family Residential	$20,000
2176	SMITH ROY R JR ETUX	02301 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2203	WATT SHERRY K	02307 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2210	PINKSTON LONNIE G	02302 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2234	KEELY PAUL E & IRIS M	02310 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2241	HAMMITT MELVA M	02315 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2267	KEELY PAUL E	02316 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2277	KEELY PAUL E	02320 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2300	BETTS LEROY H	02321 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2312	VAUGHN THOMAS E ETUX	02327 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2335	KING MARY T	02326 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2354	VAUGHN THOMAS E ETUX	02333 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2362	PATTERSON RAY & ROBERTA	02334 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2379	REAMS RUBY M	02337 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2391	PATTERSON MILDRED A ETAL	02336 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2396	WILDRIX CLYDE E ETUX	02343 S MOSLEY	AVE	WICHITA	67211	111	Single Family Residential	$20,000
2420	MAISCH THEODORE W SR LIVING TR	02342 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
2437	WALTERS ERNEST K ETUX	02347 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2443	M & M PARTNERSHIP	02349 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
2450	MILLER JEFFREY C	02353 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
2462	CROW JERRY L & MARJORIE I	02357 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
31	PAULETIC GERALD ETUX	02403 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
32	MOORE ALAN E ETUX	02402 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
43	BRYAN ALTON L	02409 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
44	RUSH DANNY W ETUX	02408 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
62	COOK MARJORIE B	02415 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
65	SMITH DAVID A	02414 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
83	PHAM KIM D & TRUNG	02421 S MOSLEY	AVE	WICHITA		111	Single Family Residential	$20,000
87	PALACIO PORFIRIO C JR & EVELYN L	02420 S MEAD		WICHITA	67216	111	Single Family Residential	$20,000
104	BALDAUF ROBERT C & RHONDA L	02425 S MOSLEY	AVE	WICHITA	67216	111	Single Family Residential	$20,000
106	PEARCE FAMILY LOV TRUST	02426 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
114	BAUMUN JACK L ETAL	02431 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
126	KNIGHT KAREN LEE	02432 S MEAD		WICHITA	67216	111	Single Family Residential	$20,000
144	JAMES GREGORY A & JULIE L	02436 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
145	BOLING ROBERT G ETUX	02437 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
166	BRADFIELD MARY K	02442 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
174	HEIN HUGH	02443 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
187	TOPPINS CHARLES B & DAWN LEIGH	02446 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
203	BANKERS TRUST CO OF CA TRUSTEE	02451 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
208	SEDGWICK STATE BANK	02452 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
227	KESSLER BETTY L & RICHARD S	02456 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
226	HORNBAKER KELLY R & SANDRA ETA	02457 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
236	CROW JERRY L ETAL	02464 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

237	CROW JERRY L & MARJORIE I	02463 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
255	ROBERTS DALLAS E & ELAINE	02469 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
278	HARVEY TERRY W	02475 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
294	DWYER SUSAN K & LOREN L	02503 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
317	MAY ROSS & DARLENE FAMILY LIVIN	02509 S MEAD		WICHITA	67216	111	Single Family Residential	$20,000
339	ALLEN ANNA MAE	02515 S MEAD	AVE	WICHITA	67216	111	Single Family Residential	$20,000
361	WALKER MARY R	02521 S MEAD		WICHITA	67216	111	Single Family Residential	$20,000
384	COX RICHARD L & PATRICIA A WESTL	02525 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
403	EHRLICH BILL J	02531 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
424	BUEHLER WYNEMA	02537 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
443	GRABER KURT A	02541 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
467	WILLEMS RICHARD E ETUX	02547 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
490	LAMOREAUX JUANITA A	02553 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
497	PRESTON CAROLYN B ETAL	02557 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
523	ROEDER WILBUR L ETUX	02563 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
536	BUCHANAN PEARL A	02569 S MEAD	AVE	WICHITA		111	Single Family Residential	$20,000
555	ROCKEFELLER MONTEEN	02603 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
573	FERRELL KENNETH M & MARGARET	02609 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
646	MILES TROY	00000				111	Single Family Residential	$20,000
691	MALCOM BETTY J	02651 S SANTA FE		WICHITA		111	Single Family Residential	$20,000
747	MERHOFF JAY SCOTT	00600				111	Single Family Residential	$20,000
769	JANSSEN REBECCA L	02675 S SANTA FE	AVE	WICHITA		111	Single Family Residential	$20,000
795	TURNER FLOYD L ETUX	00000				111	Single Family Residential	$20,000
819	GOEHRING MARK A & JOYCE A	02715 S SANTA FE		WICHITA	67216	111	Single Family Residential	$20,000
762	HENNING VICTOR A ETAL	03651 S BROADWAY	ST	WICHITA	67216	111	Single Family Residential	$20,000
161	WOOSTER WALTER A ETUX	05600 N OLIVER	ST	KECHI	67067	111	Single Family Residential	$20,000
175	DONDLINGER ROBERT G & SUE B	05609 N OLIVER				111	Single Family Residential	$20,000
474	FORD JAMES S ETUX	03330 E 45TH	ST N	WICHITA	67220	111	Single Family Residential	$20,000
635	FARLEY FRANK K	03400 E 45TH	ST N	WICHITA	67220	111	Single Family Residential	$20,000
185	LUTKIE CHARLES J ETUX	00000				111	Single Family Residential	$20,000
211	LUTKIE CHARLES J ETUX	04423 S MAIN	ST	WICHITA		111	Single Family Residential	$20,000
236	WILCOX THOMAS L JR & NANCY L	00101 E VALLEY	RD	WICHITA	67216	111	Single Family Residential	$20,000
300	MORRIS DONNA JEAN	00100 E 44TH	ST S	WICHITA	67216	111	Single Family Residential	$20,000
321	RUNDLE RAY R ETUX	04459 S MAIN	ST	WICHITA		111	Single Family Residential	$20,000
372	AVERY GERALD CALVIN	04501 S MAIN	ST	WICHITA		111	Single Family Residential	$20,000
409	BUCKLEY KIMBERLY KAY ETAL	04513 S MAIN	ST	WICHITA		111	Single Family Residential	$20,000
436	DUKE J E JR ETUX	04515 S MAIN		WICHITA	67217	111	Single Family Residential	$20,000
467	CONRAD CHAROLETTE L	04535 S MAIN	ST	WICHITA		111	Single Family Residential	$20,000
546	HAGER SHERRI S & MONROE	04601 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
605	SCHOTTLER ERIC	04607 S WATER	ST	WICHITA	67217	111	Single Family Residential	$20,000
626	TETER BRIAN G & GRETCHEN M	04621 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
667	PAGE MILDRED L ETAL	04631 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
686	CLINE RONALD R ETUX	04641 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
706	LAWSON DARRYL A & JOYCE M	04645 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
740	WINKLER THOMAS Z ETAL	04705 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
754	BUCKLEY GEORGE A	04707 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
802	GILBERT DENNIS W	04729 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
836	BLISS HAROLD W ETUX	04733 S WATER	ST	WICHITA		111	Single Family Residential	$20,000
836	WILSON BOBBY J & JANICE K	00316 W 47TH	ST S	WICHITA	67217	111	Single Family Residential	$20,000
840	FOX PATRICIA N	00328 W 47TH	ST S	WICHITA	67217	111	Single Family Residential	$20,000
4	ANDREW ALBERT M & CORALIE J	00331 W 47TH	ST S	WICHITA	67217	111	Single Family Residential	$20,000
32	PHILLIPPE RONALD E ETUX	00333 W 47TH	ST S	WICHITA	67217	111	Single Family Residential	$20,000
432	CLINE BARBARA L & TONY A	05340 S GOLD		WICHITA		111	Single Family Residential	$20,000
453	ALLEN CECIL JAMES & MELISSA A	05408 S GOLD		WICHITA	67217	111	Single Family Residential	$20,000
475	GLASS GEORGE EUGENE & CINDY DE	05416 S GOLD		WICHITA	67217	111	Single Family Residential	$20,000
496	DUCKWORTH JEFFREY S & CRYSTAL	05426 S GOLD		WICHITA	67217	111	Single Family Residential	$20,000
527	KINCAID BRADLEY D & LINDA M	05434 S GOLD		WICHITA		111	Single Family Residential	$20,000
546	LOONEY SHIRLEY H	05444 S GOLD		WICHITA		111	Single Family Residential	$20,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

572	MITCHELL DONALD D & HEATHER S	05452 S GOLD	CT	WICHITA		111	Single Family Residential	$20,000
601	JANSEN DANIEL M & RACHEL A WAK	05458 S GOLD	CT	WICHITA		111	Single Family Residential	$20,000
636	BARNUM GARY L & MICHELLE D	05464 S GOLD		WICHITA		111	Single Family Residential	$20,000
639	RICHARDSON PHILLIP L & SHERYL L	05470 S GOLD	CT	WICHITA	67217	111	Single Family Residential	$20,000
22	LOUGH JOAN & LARRY	00825 W 55TH	ST S			111	Single Family Residential	$20,000
38	KNIFLEY ROBERT T JR	00000				111	Single Family Residential	$20,000
51	KNIFLEY ROBERT T JR	00805 W 55TH	ST S	WICHITA	67217	111	Single Family Residential	$20,000
66	HILL TIMOTHY D ETAL	00809 W 55TH	ST S	WICHITA	67217	111	Single Family Residential	$20,000
91	SCOTT C DOUGLAS & DEBORAH D	00815 W 55TH	ST S			111	Single Family Residential	$20,000
180	FOSTER GARY R	05924 S OSAGE		WICHITA	67216	111	Single Family Residential	$20,000
227	ERBERT KENNETH F & MARILEE	05936 S OSAGE		WICHITA	67217	111	Single Family Residential	$20,000
339	JOHNSON GARY L ETUX	00746 W 61ST	ST S	WICHITA	67217	111	Single Family Residential	$20,000
361	VLADIMIR FISPERA	06209 SOUTHERN	ST			111	Single Family Residential	$20,000
366	ELKINS CARMEL	06235 SOUTHERN	ST			111	Single Family Residential	$20,000
379	SCOTT BILLY A ETUX	00800 W WALLINGFORD				111	Single Family Residential	$20,000
384	GREEN FRANK A	00821 WALLINGFORD		WICHITA	67217	111	Single Family Residential	$20,000
386	HAYNES KAREN	00835 N WALLINGFORD				111	Single Family Residential	$20,000
400	ROBY [illegible]ERRILL M & DANA L	00902 W 63RD	ST S	WICHITA	67217	111	Single Family Residential	$20,000
401	STRO[illegible]PE BOBBY R	00906 W 63RD	ST S	WICHITA	67217	111	Single Family Residential	$20,000
32	COOK WILLIAM D	06400 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
49	COOK WILLIAM D	06406 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
53	WHITE GARY L & EARLENE F	06410 S OSAGE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
79	WHITE DEBRA L	00000 S OSAGE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
95	DICKEY DALE E ETUX	06441 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
107	CORBETT JOHNNY R ETUX	06436 S OSAGE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
163	TURKLE F M ETUX	06500 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
175	TURKLE JON W ETAL	06510 S OSAGE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
194	NOONEY GARY S ETUX	06516 S OSAGE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
215	NOONEY GARY S ETUX	06522 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
253	JOST CAREY G & LORRI L	06534 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
261	JOST CAREY G & LORRI L	06540 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
291	MANTHEY MIKE S ETUX	06546 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
302	LOHKAMP SHARRON A	06552 S OSAGE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
340	SOTO ELENA D	06610 OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
348	LINCICOME MARK & SHANNON T	06618 S OSAGE		HAYSVILLE	67060	111	Single Family Residential	$20,000
384	HOLMES LARRY D ETUX	06624 S OSAGE	CT	HAYSVILLE	67060	111	Single Family Residential	$20,000
468	HEMPHILL VIRGINIA T	00356 N MAIN	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
517	GREGG JERRY L & SHIRLEY L	00200 HEMPHILL		HAYSVILLE	67060	111	Single Family Residential	$20,000
525	LARKIN DOROTHY BELL	00341 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
536	MC CORMACK ROY EUGENE ETUX	00337 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
554	RIEGLE RANDY L	00331 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
575	STEELE ARTHUR L ETUX	00327 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
586	CORDER PERRY A ETUX	00321 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
606	VANDEGRIFT LEROY E & TAMMY DIC	00315 BAUGHMAN		HAYSVILLE	67060	111	Single Family Residential	$20,000
623	GERHARDT KENNETH E ETAL	00260 N MAIN	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
627	BLAINE JOHN A SR & MARGIE L	00309 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
642	LARSON CHARLES E ETUX	00303 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
668	MURROW NORLEEN & JEROLD	00255 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
679	BOLING MELVIN & MEARL	00246 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
697	WISE NANCY	00243 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
725	WALLIS BUD LEE ETAL	00237 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
749	PRESTAGE BRANDI DEANN	00233 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
772	ELLIOTT MARK S	00225 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
793	COLDIRON EDWARD D JR & MICHELL	00217 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
822	VETERANS ADMINISTRATION	00211 BAUGHMAN	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
25	CITY OF HAYSVILLE	00100 S MAIN	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
55	HILL THOMAS E	00137 S HAYS	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
113	COOPER GARY D ETUX	00200 S MAIN	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

120	GUY NORMAN J & LOIS J	00209 S HAYS	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
128	GUY NORMAN J & LOIS J	00212 S MAIN	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
148	JAMES HEDY ROBERTA	00240 S MAIN	ST	HAYSVILLE	67060	111	Single Family Residential	$20,000
234	MC ELROY ROBERT D ETUX	00210 TURKLE		HAYSVILLE	67060	111	Single Family Residential	$20,000
255	STEINLE W FRED & GLENDA J	00214 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
276	GORDANIER BRADLEY S	00220 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
300	LLOYD CLAUDE L ETUX	00226 TURKLE		HAYSVILLE	67060	111	Single Family Residential	$20,000
319	LITTON MORTGAGE SERVICING CEN I	00230 TURKLE		HAYSVILLE	67060	111	Single Family Residential	$20,000
341	VETERANS ADMINISTRATION	00238 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
370	RICHARDSON CARLA JO	00240 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
388	CLARE DALE E & JOYCE E	00246 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
414	CLINE LORA M	00250 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
438	BRIDWELL GLENN E JR & STEPHENE	00254 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
460	OVERMAN CHRIS A & VALORIE L	00258 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
478	WASHBURN JOE T & DWAINE COTTO	00300 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
501	ELY RICHARD O	00310 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
524	KIMBLE RAYMOND K & CYNTHIA K	00316 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
546	HOOPER JENNIFER L	00320 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
565	HAMM DAVID W & ROSE M	00328 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
579	HELMLINGER WARREN ETUX	00334 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
605	NGUYEN NA T & JACKSON KO	00340 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
623	SHINKLE DIANA S	00344 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
652	STARR ORIS L & DOROTHY I	00350 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
675	JACOBS LARRY & BRENDA	00354 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
694	CRAVENS JOE JR	00360 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
808	DESMARTEAU LONNY F ETUX	00420 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
848	JOLIVET ROY C	00428 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
877	ROBINSON TONI L	00434 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
917	BROZ RICHARD A ETUX	00440 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
938	BRIDWELL GLENN E JR & STEPHENE	00446 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
940	WILSON PATRICIA E	00454 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
986	LINNEN MARY E	00460 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
999	WELLS FREDERICK M	00500 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1027	GULDNER JESSE B & CRYSTAL C	00506 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1035	MORRISON SHERRY A	00512 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1039	WILLIAMS MORRIS T & DONNA M	00518 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1065	BLANKE HEATH J & HEATHER R	00524 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1071	BRUNER JOE W & NANCY L	00530 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1095	STANDLEY KENNETH E ETUX	00538 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1099	WILSON DATTON JR ETUX	00544 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1107	SAMPLE WILLIAM E & VICKIE S	00550 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1127	SPENCER ROBERT G ETUX	00556 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1139	GREENE RICHARD L JR	00562 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1157	HOLMES BILLY M JR ETUX	00568 TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1159	STEPHENS RICHARD E & DANA S	00574 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1174	LEHMAN FRANKLIN E & YVONDA L PL	00580 S TURKLE	AVE	HAYSVILLE	67060	111	Single Family Residential	$20,000
1187	HUMFELD JACKIE E ETAL	00586 TURKLE		HAYSVILLE	67060	111	Single Family Residential	$20,000
1829	ROSSITER I L	00704 E BOSTON	ST	WICHITA	67211	112	Duplex	$40,000
1883	MC DERMOTT JACK ETUX	00705 E BOSTON	ST	WICHITA	67211	112	Duplex	$40,000
2139	INKELAAR THOMAS T ETUX	01546 S SANTA FE		WICHITA		112	Duplex	$40,000
126	CHAFFIN DAVID D	01616 S SANTA FE	AVE	WICHITA		112	Duplex	$40,000
181	ASSOCIATES FINANCIAL SERVICES C	01631 S MOSLEY	AVE	WICHITA		112	Duplex	$40,000
425	GOEVERT BERNARD J ETUX	01719 S SANTA FE	AVE	WICHITA		112	Duplex	$40,000
708	WILSON LOAL	01821 S MOSLEY		WICHITA		112	Duplex	$40,000
714	SANDEFUR RALPH G ETUX	01816 S SANTA FE	AVE	WICHITA		112	Duplex	$40,000
1466	DEBBRECHT JOE L & JANET L	02059 S MOSLEY		WICHITA	67216	112	Duplex	$40,000
1789	HURLEY DEAN W & ADRIENNE	02150 S SANTA FE		WICHITA		112	Duplex	$40,000
1805	BRANDES JOHN W ETUX	00808 E KINKAID	AVE	WICHITA		112	Duplex	$40,000

Table 8.2 Wichita Building Sound Insulation Cost Estimate

2100	BUHRLE EARL M & REBA M	02248 S SANTA FE	AVE	WICHITA		112	Duplex	$40,000
2258	REYES RAYMOND W ETAL	02317 S MOSLEY		WICHITA		112	Duplex	$40,000
133	WILLIAMS W O & JEREMY A	00230 S MAIN	ST	HAYSVILLE	67060	112	Duplex	$40,000
142	MARTIN LAWRENCE W	01625 S MOSLEY	AVE	WICHITA		113	Triplex	$60,000
1159	BOYER WILLIAM R ETUX	00000				113	Triplex	$60,000
1652	LAMBERT ISADOR R ETUX	01408 S SANTA FE		WICHITA	67211	114	Fourplex	$80,000
673	WADLEY HOMES INC	00000				116	Condo-Common Element	
682	WADLEY HOMES INC	00000				116	Condo-Common Element	
580	EASTON W J JR	00000				117	Mobile Home Site	$5,000
113	PETERSON RALPH & ROBERTA	00619 W 55TH	ST S	WICHITA	67217	117	Mobile Home Site	$5,000
139	HANAFIN SHIRLEY	00000 S OSAGE				117	Mobile Home Site	$5,000
349	LECUYER JOHN	08201 W SOUTHERN		WICHITA	67217	117	Mobile Home Site	$5,000
385	BLAKE THOMAS W & SHERILYN R	00827 W WALLINGFORD				117	Mobile Home Site	$5,000
389	BURLESON KENNETH D & JEANICE M	00800 W 63RD	ST S	WICHITA	67217	117	Mobile Home Site	$5,000
142	NOONEY JASON P	08440 S OSAGE		HAYSVILLE	67060	117	Mobile Home Site	$5,000
1871	LAMBERT ISADOR R ETUX	01416 S SANTA FE		WICHITA		119	Garden Apartment	$20,000
72	BROWN BETTIE	04205 S BROADWAY	ST	WICHITA	67216	119	Garden Apartment	$20,000
2150	KERSCHEN ALBERT M & MARILYN J	00722 E BLAKE		WICHITA	67211	123	Rooming House	$20,000
333	SOCIETY OF SAINT PIUS X SW DIST I	01704 S SANTA FE	AVE	WICHITA		670	Church	$50,000
33	CHURCH OF CHRIST	00801 W 63RD	ST S	HAYSVILLE	67060	670	Church	$50,000
29	VICTORY INDEPENDENT BAPTIST CH	00100 S HAYS		HAYSVILLE	67060	670	Church	$50,000
74	INTERNATIONAL CH OF FOURSQUAR	00139 S HAYS	ST	HAYSVILLE	67060	670	Church	$50,000
26	CITY OF WICHITA	03315 N GROVE		WICHITA	67219	735	Park	
31	CITY OF WICHITA	00000				735	Park	
46	CITY OF WICHITA	00000				735	Park	
63	WICHITA BOEING EMPLOYEES ASSO	04226 S GOLD		WICHITA	67217	735	Park	
31	CITY OF HAYSVILLE	00000				735	Park	
							Total	[illegible]

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Appendix L Grade Separation, Traffic Barrier, and Street Closure Engineering

Appendix L
GRADE SEPARATION, TRAFFIC BARRIER, AND STREET CLOSURE ENGINEERING

This appendix describes the potential property impacts of constructing grade separations at Pawnee, Central, 13th Street North, and 21st Street North in Wichita, illustrates the conceptual design of the structures at Pawnee, and shows the conceptual design of safety barriers that would separate the UP rail line from traffic on Mead.

Figure L-1 shows cross-sections of the conceptual design for components of the Pawnee grade separation. The structures in the conceptual grade separation at other location would have different cross sections tailored to the characteristics of each conceptual grade crossing.

Figure L-2 shows the conceptual design for guardrails, gates, and fences that would create safety barriers along Mead, as well as the concrete barriers that could be used to block cross streets that could be closed at the UP rail line.

Pawnee Underpass

Properties Affected

Santa Fe, Mosley and three alleys on the north side of Pawnee would be closed to through traffic.

Entrances to parking lots in front of Galaxy Audio and Team Electric Supply Company would be closed. A frontage service road to connect the parking lot to St. Francis would be provided.

Store/bar and garage between railroad and alley would lose their entrances from Pawnee. Entrance from side alley or through frontage access road would be provided.

Residences between St. Francis and Mosley along Pawnee would lose entrances from Pawnee. A frontage service road connecting Mosley, Mead, Santa Fe, St. Frances and alleys would be constructed to provide entrances to the houses.

Properties to Be Acquired

Strips of land on both sides of Pawnee, approximately 20 feet by 1,200 feet, for construction of underpass and service roads.

Parco Distributor Company, approximately 3500 square feet, for construction of relocated Mead.

Central Overpass

Properties Affected

Emporia, St. Francis, and Mosely would be closed to through traffic at their intersections with Central due to the construction of the overpass.

Hiland Dairy Foods would have no access to Central overpass, but traffic from Hiland Dairy Foods could cross Central under the overpass at Santa Fe. Santa Fe is a gravel road and would need to be paved.

Parking lots along Central would need their entrances relocated.

Parking lot entrances to several apartment complexes between Emporia and Mosely adjacent to Central would be relocated.

Properties to Be Acquired

Strips of land on both sides of Central, approximately 20 feet by 500 feet, for construction of service roads.

13th Street North Overpass

Properties Affected

As described below, several businesses, industries, and residences would lose their direct access to 13th Street North because the total length of the overpass would be approximately 2,880 feet.

Cargill Soybean Processing Plant would lose its entrance to 13th Street North because of the overpass but could have access under the overpass at Santa Fe and Mosley.

Mattress Factory Outlet, the Conoco gas station, and a storage building would have similar impacts to those at Cargill Soybean Processing Plant as described above.

An elementary school between Wabash and Ohio would lose its entrances. Service roads on either side of the overpass would be constructed to create an alternative access to the school.

Wabash, Ohio, St. Francis, and Emporia would be closed to through traffic at the 13th Street North overpass.

The auto parts store and businesses between Santa Fe and St. Francis would lose direct access to 13th Street North, but would be provided with a frontage service road crossing at Santa Fe under the 13th Street North overpass.

Residences between St. Francis and Emporia would also have frontage access roads for access to 13th Street North.

Properties to Be Acquired

Strip of land on either side of 13th Street North between Santa Fe and Emporia, approximately 15 feet by 800 feet, for service road.

Strip of land on either side of 13th Street North between Ohio and Washington, approximately 15 feet by 700 feet, for service road.

21st Street North Overpass

Properties Affected

Several businesses and industries along 21st Street North would not have direct access to 21st Street North overpass because the total length of the overpass would be approximately 2,850 feet. However, some crossings under the overpass would be available where vertical clearance is 15 feet, four inches or more.

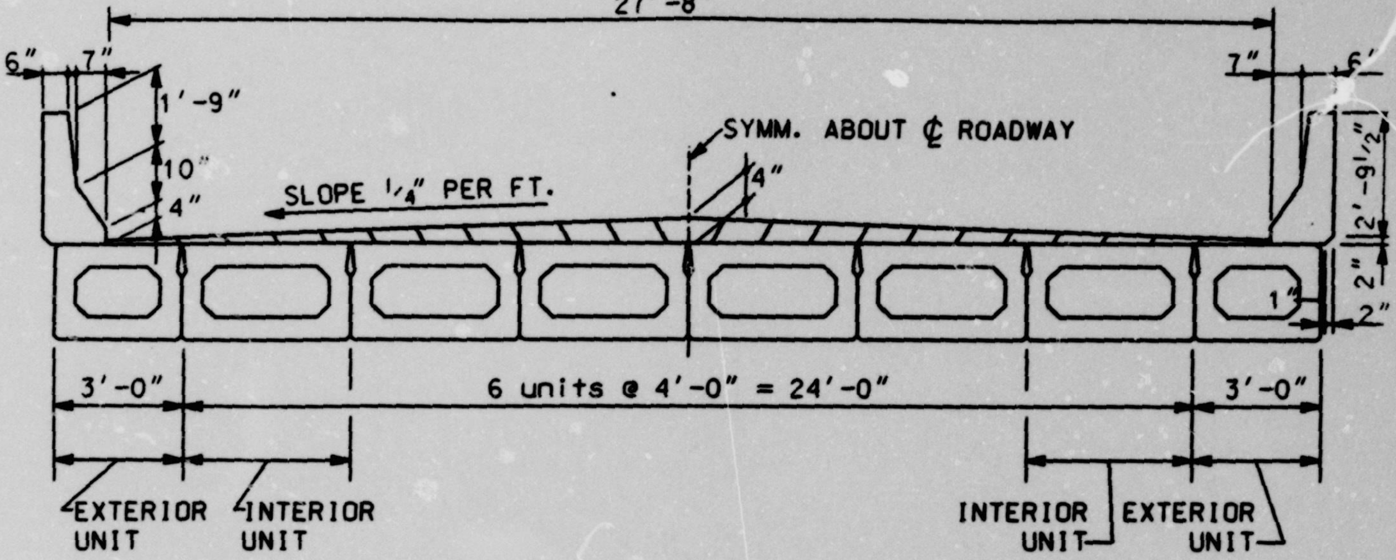
Interchange of I-135 with 21st Street North would need to be modified to accommodate the traffic patterns from the overpass and service roads serving the industries along 21st Street North.

Sutherlands Construction Yard would lose its main entrance to 21st Street North. A service road would be provided for access to 21st Street North.

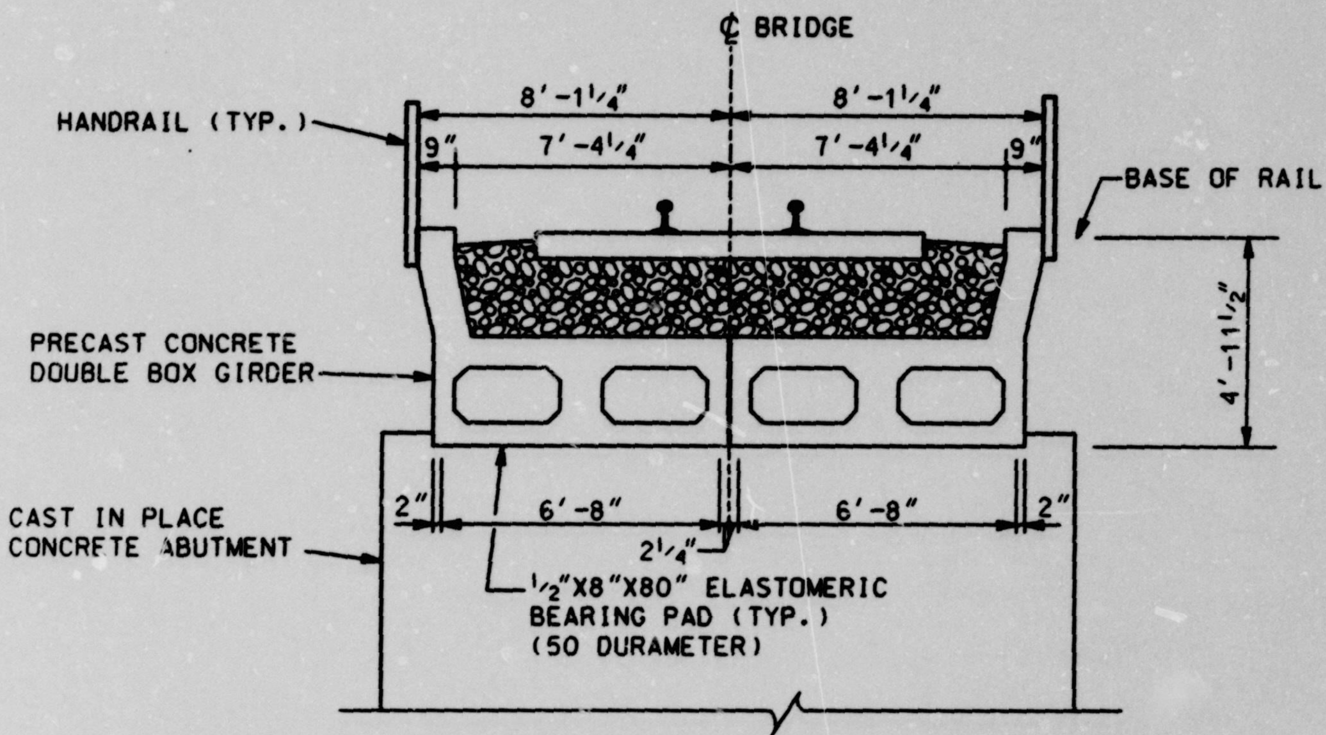
Crossroads Refrigerated Services and Wichita Frozen Foods would lose their access to the loading docks for their trucks and clients from 21st Street North. A service road would need to be constructed to allow access to the loading docks.

Properties to Be Acquired

Strip of land on either side of 21st Street North overpass, 15 feet by 1,500 feet, for providing access for business and industries to 21st Street North.



TYPICAL CROSS SECTION - ROADWAY BRIDGE



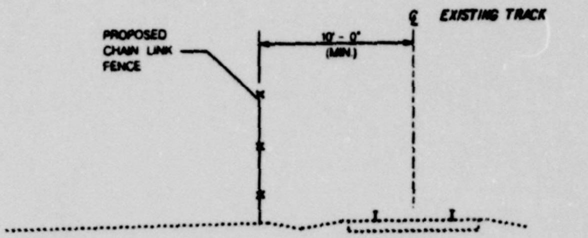
TYPICAL CROSS SECTION - ROADWAY BRIDGE

(FOR 40' SPAN OR 44' SPAN)

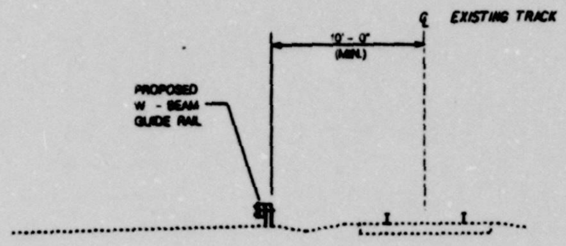
September 1997

FIGURE L-1

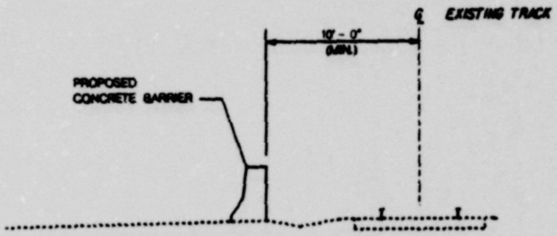
Conceptual Grade Separation - Structural Cross Sections at Pawnee



SECTION 'A'



SECTION 'C'



SECTION 'B'

LEGEND

- EXISTING FENCE
- EXISTING R.O.W.
- EXISTING O/H ELECTRIC LINE
- EXISTING O/H COMMUNICATION LINE
- PROPOSED FENCE
- PROPOSED GUIDE RAIL
- PROPOSED BARRIER
- 255 MILE POST

TYPICAL SECTIONS & LEGEND

UP SP

WICHITA

PRELIMINARY MITIGATION PLAN

September 1997

FIGURE L-2 SHEET 1 OF 21

Safety Barriers at UP Rail Line Along Mead

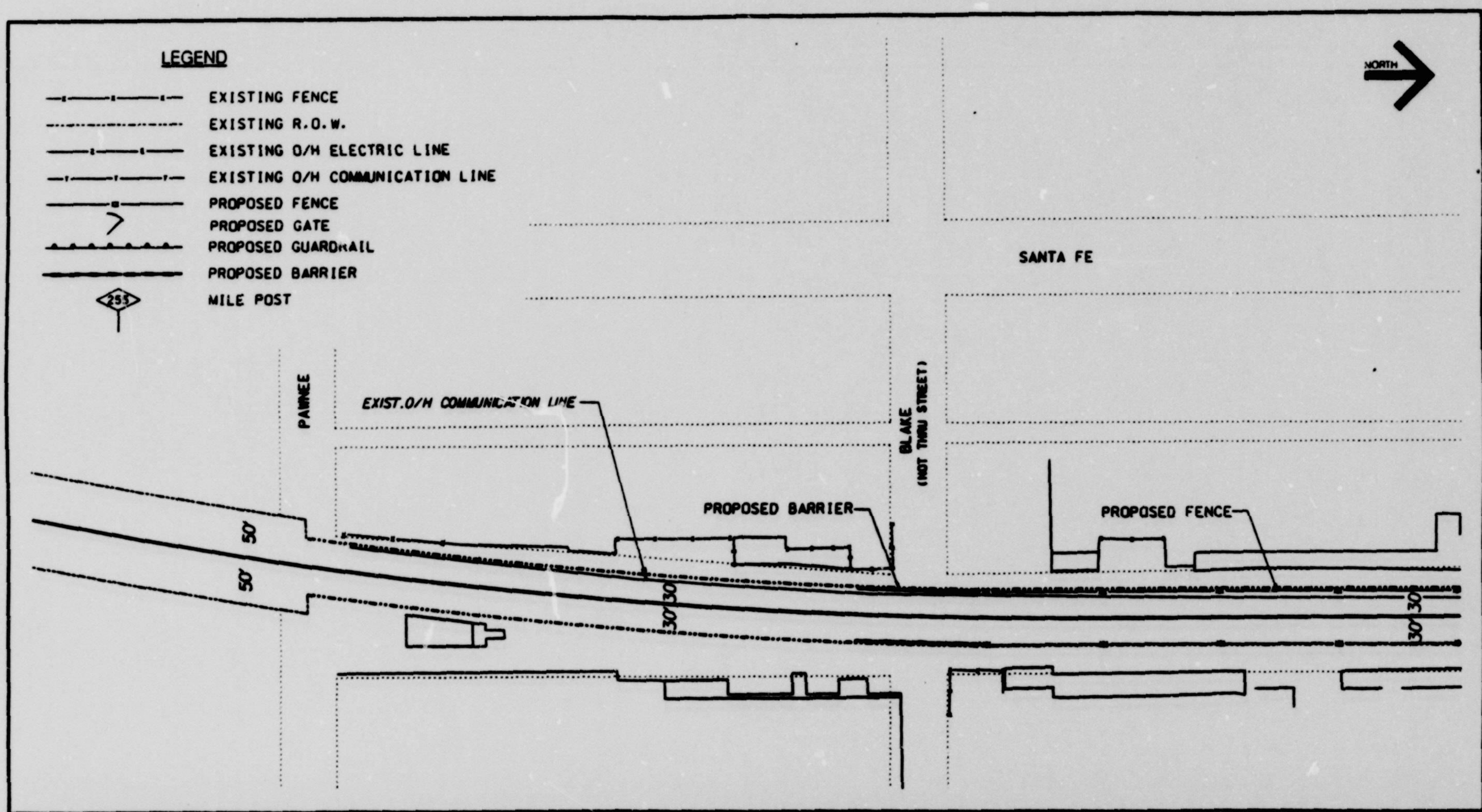
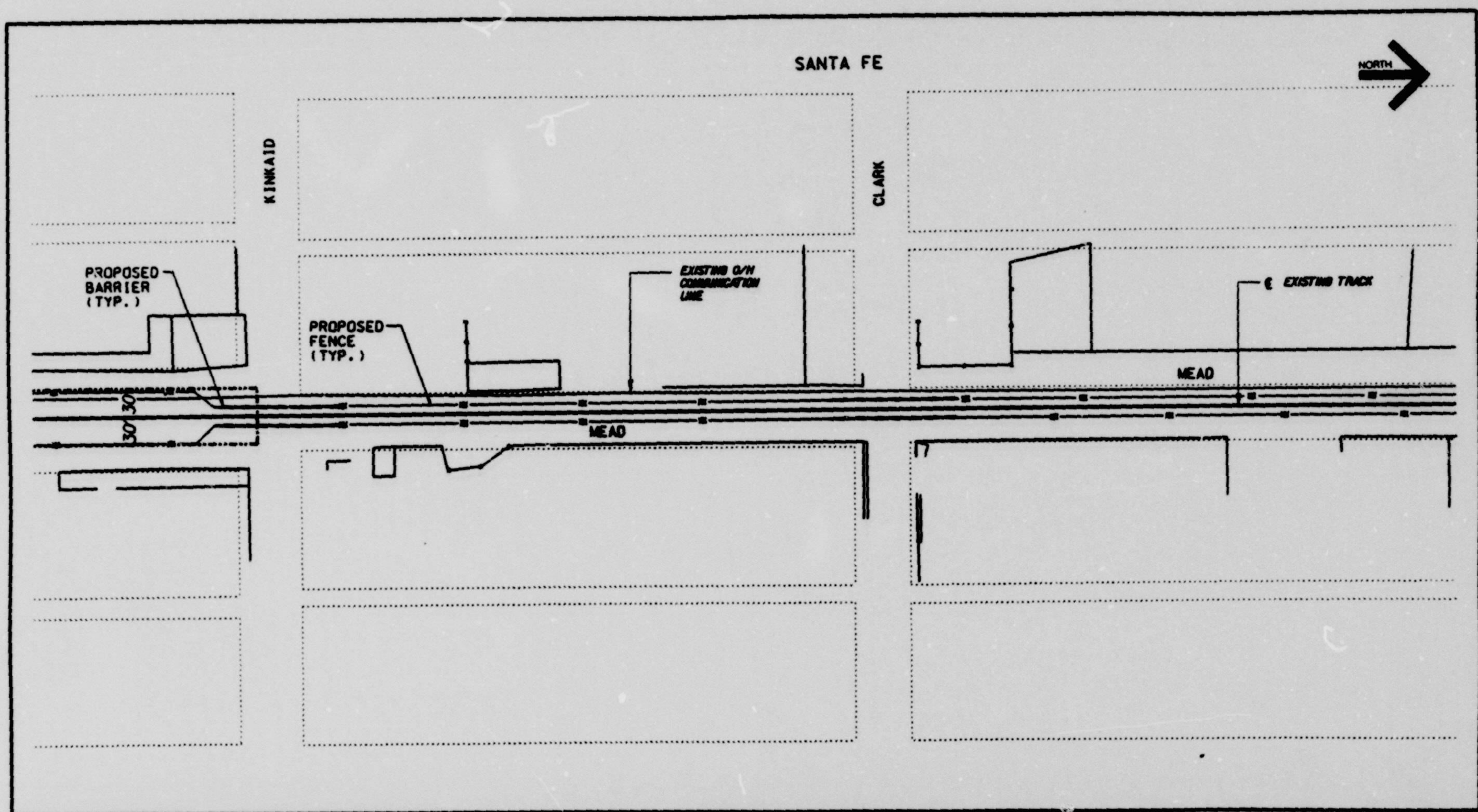


FIGURE L-2 SHEET 2 OF 21
Safety Barriers at UP Rail Line Along Mead

UP SP WICHITA

September 1997



UP SP WICHITA

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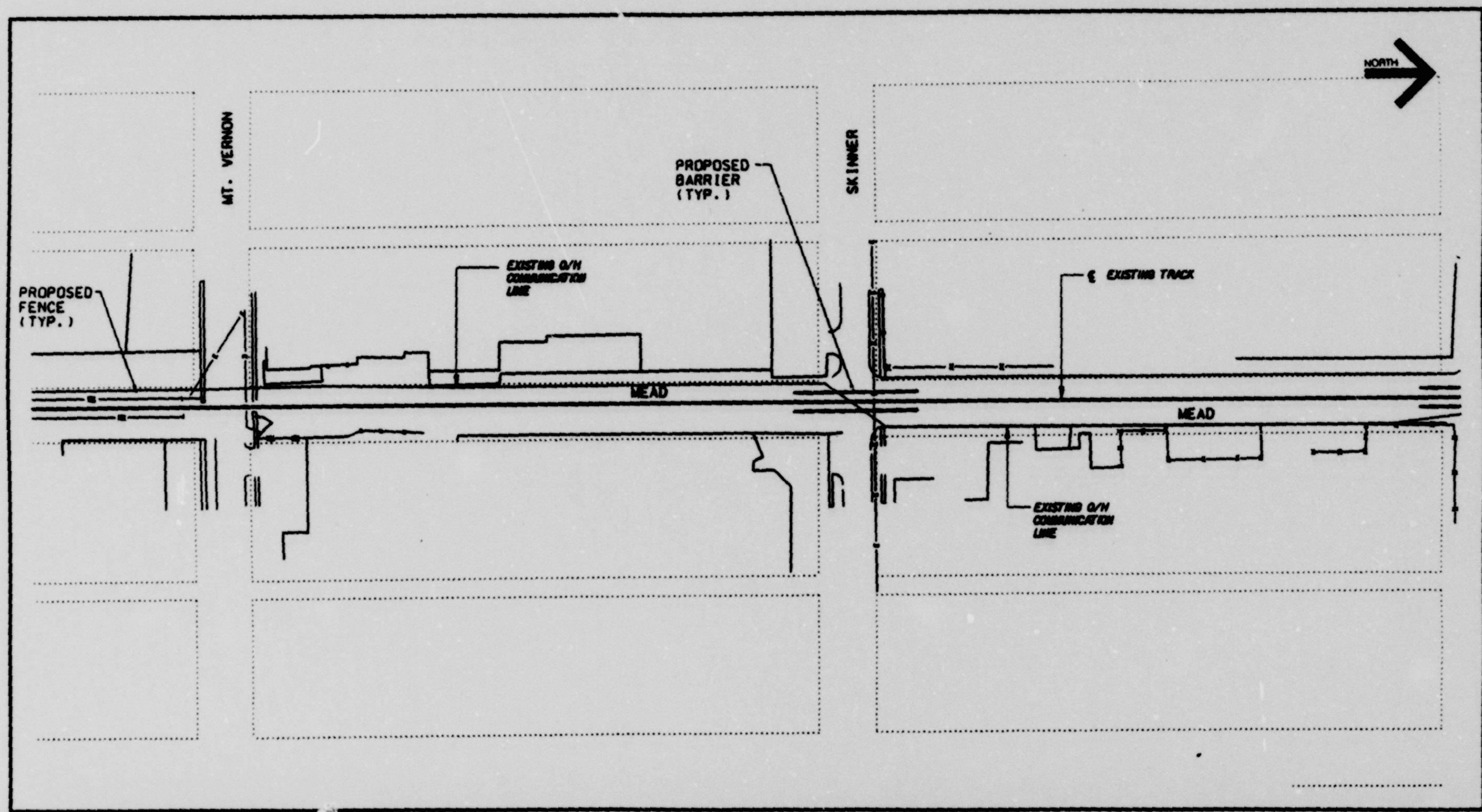
FIGURE L-2 SHEET 3 OF 21
Safety Barriers at UP Rail Line Along Mead



SURFACE TRANSPORTATION BOARD Section of Environmental Analysis

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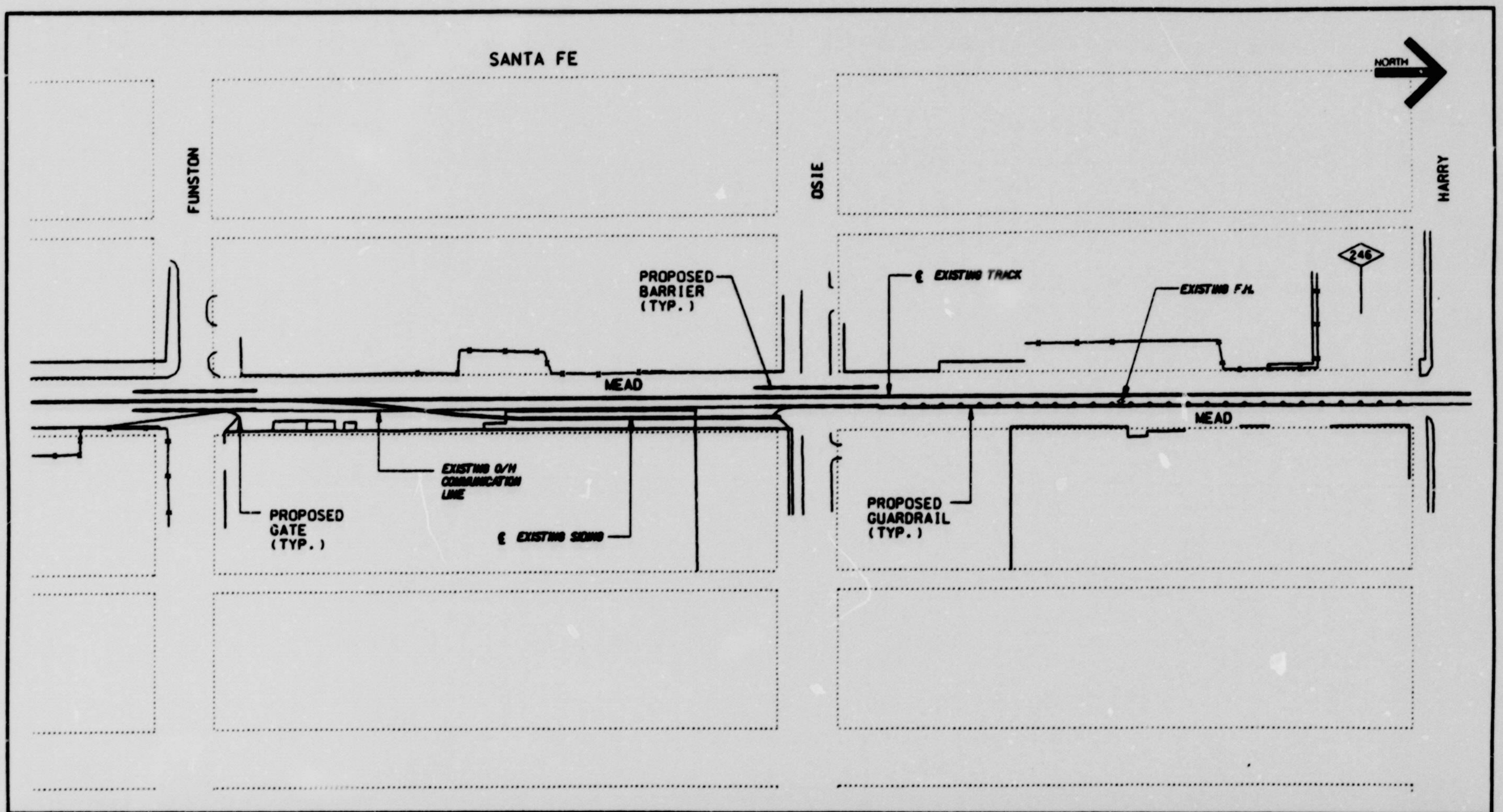
FIGURE L-2 SHEET 4 OF 21
Safety Barriers at UP Rail Line Along Mead

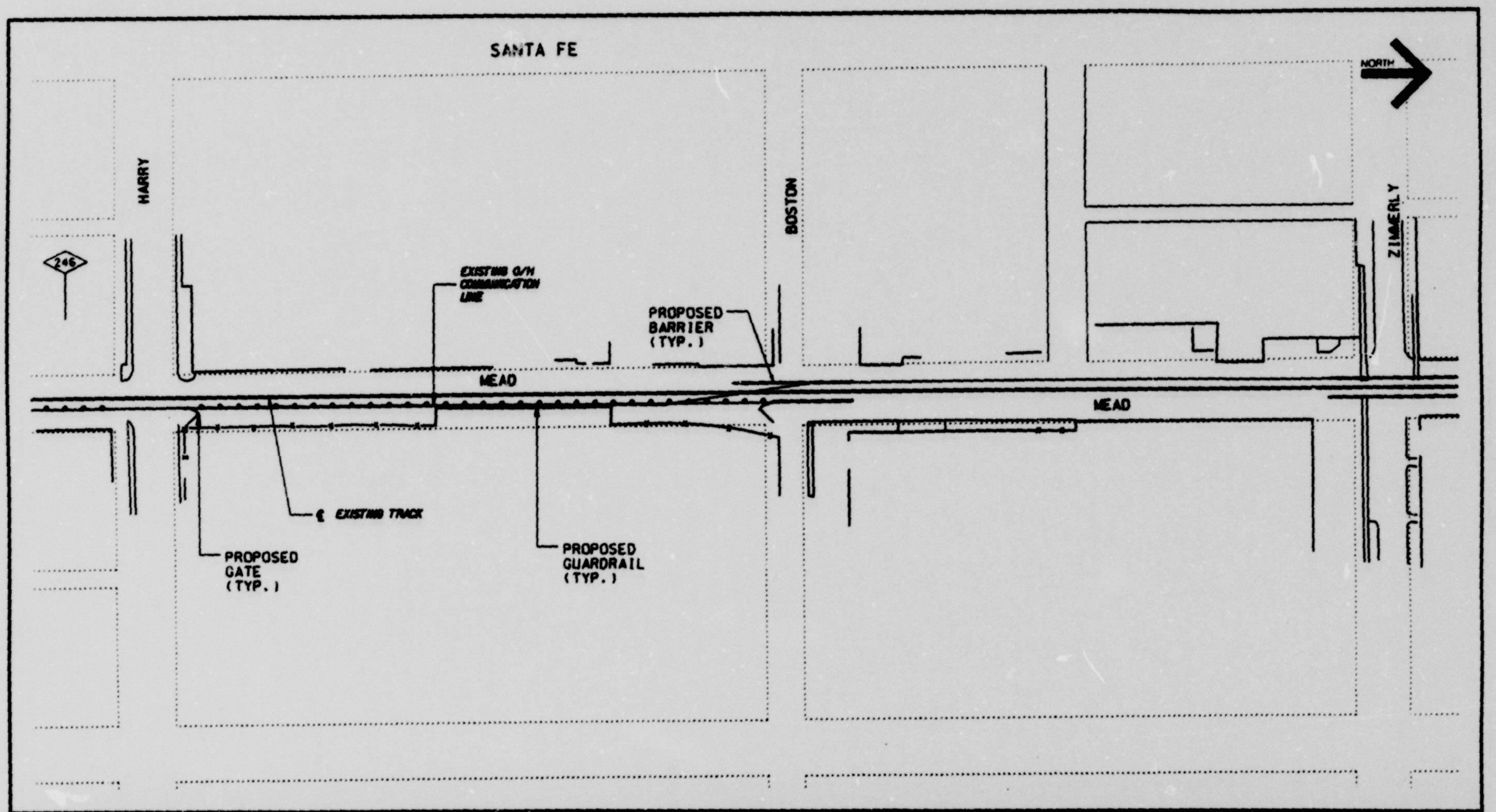


SURFACE TRANSPORTATION BOARD *Section of Environmental Analysis*

PRELIMINARY MITIGATION PLAN

FIGURE L-2 SHEET 5 OF 21
Safety Barriers at UP Rail Line Along Mead

September 1997



SURFACE TRANSPORTATION BOARD

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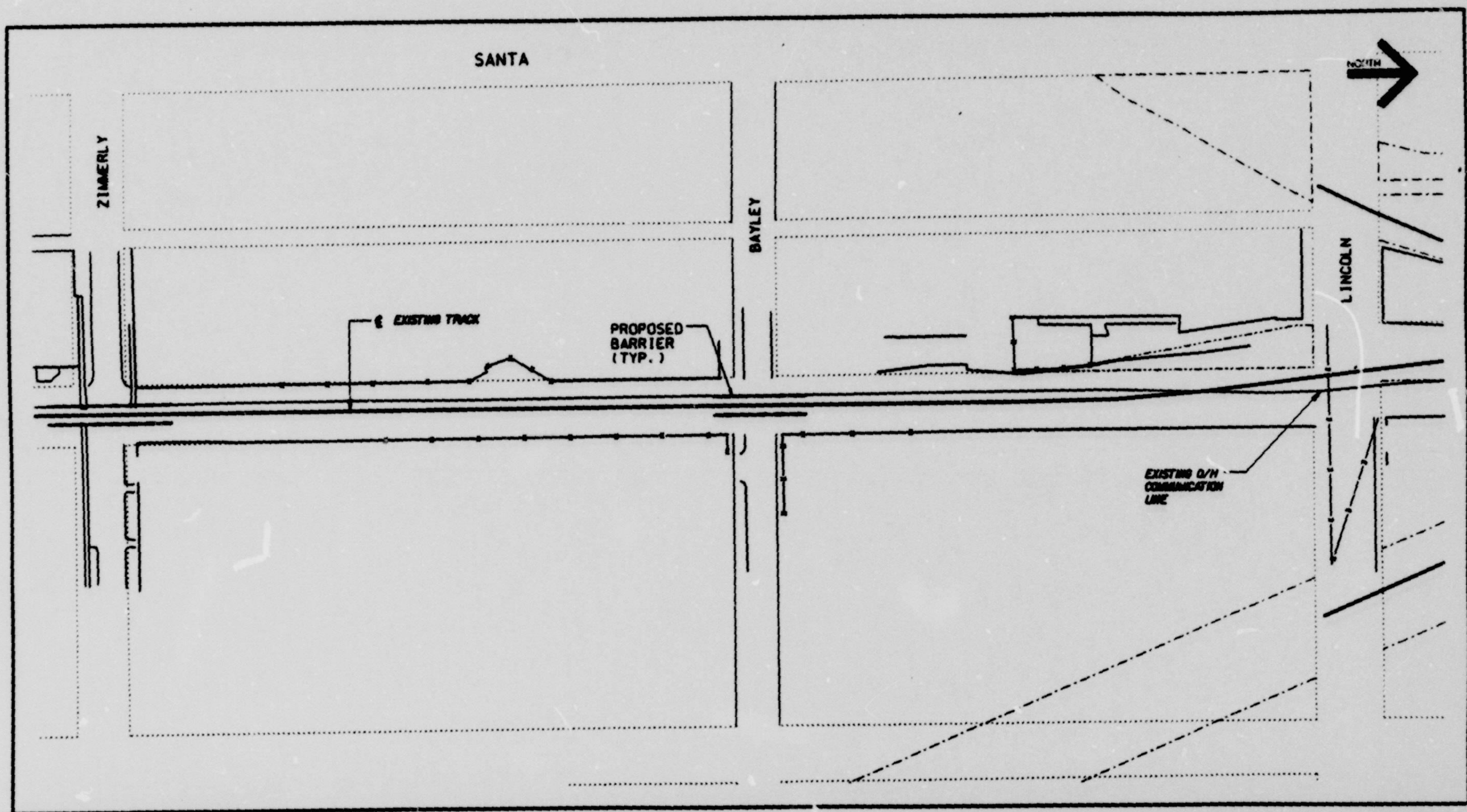
FIGURE L-2 SHEET 6 OF 21
Safety Barriers at UP Rail Line Along Mead

September 1997



SURFACE TRANSPORTATION BOARD Section of Environmental Analysis

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FIGURE L-2 SHEET 7 OF 21
Safety Barriers at UP Rail Line Along Mead

September 1997

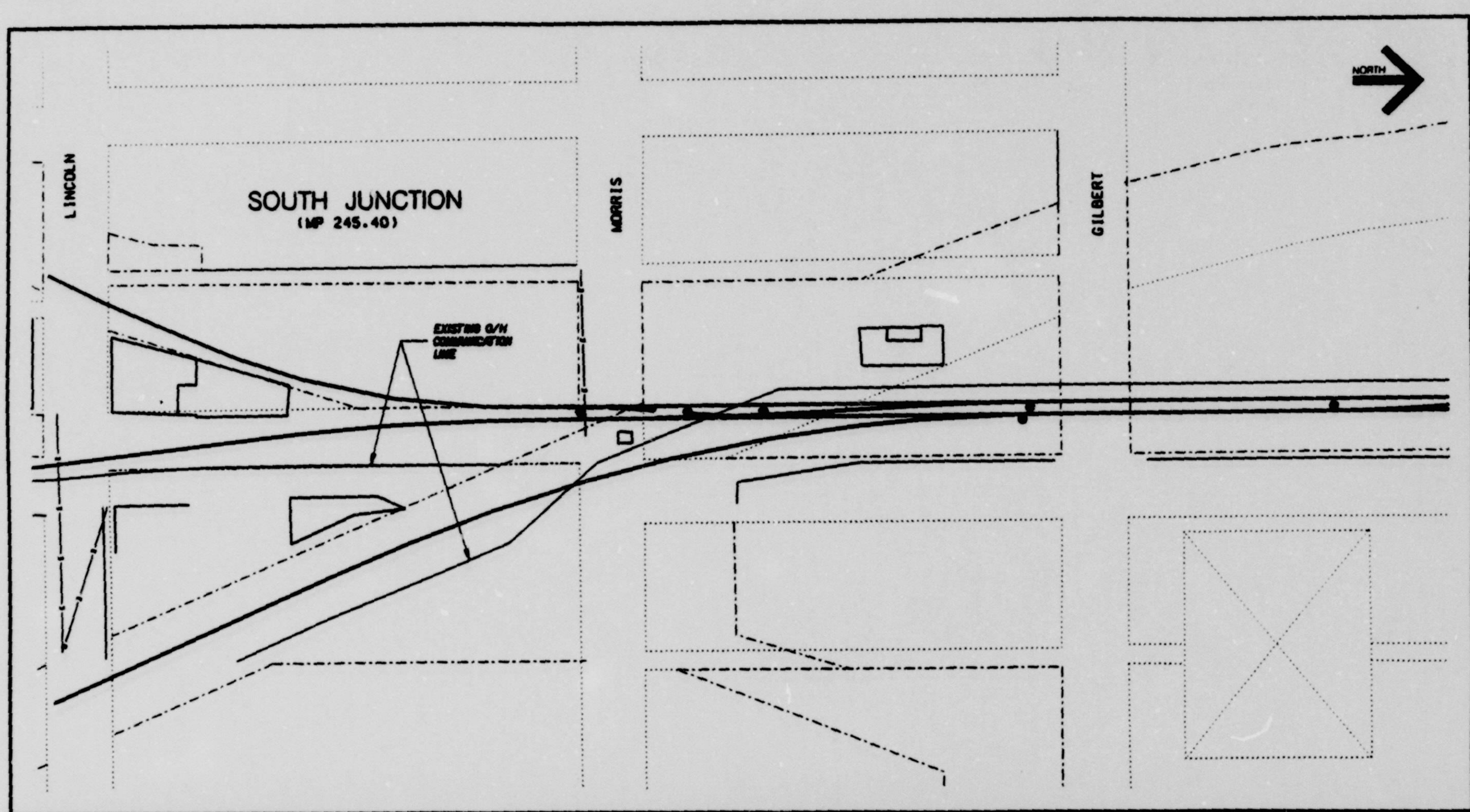

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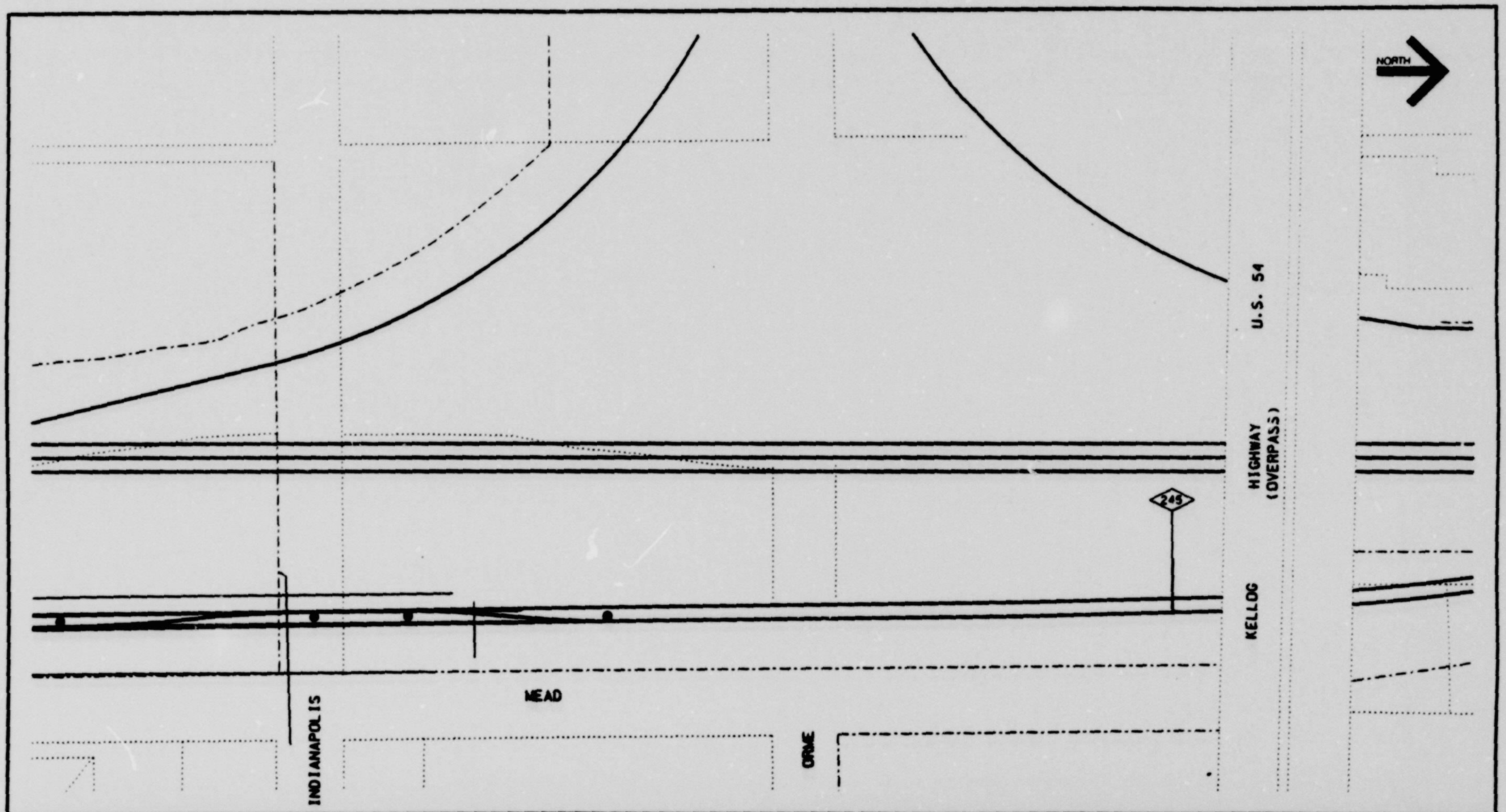
FIGURE L-2 SHEET 8 OF 21
Safety Barriers at UP Rail Line Along Mead



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PRELIMINARY MITIGATION PLAN

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FIGURE L-2 SHEET 9 OF 21
Safety Barriers at UP Rail Line Along Mead

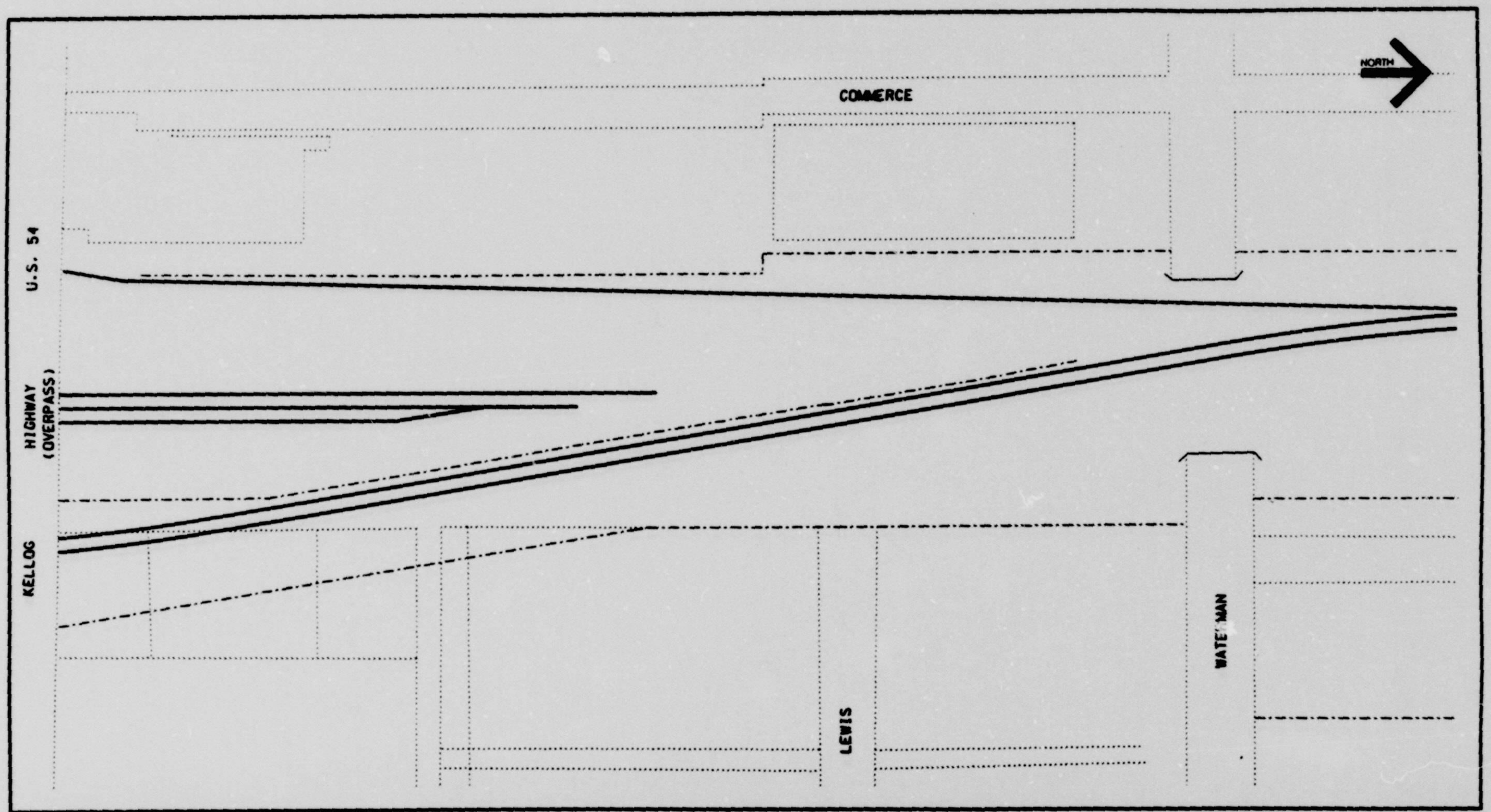

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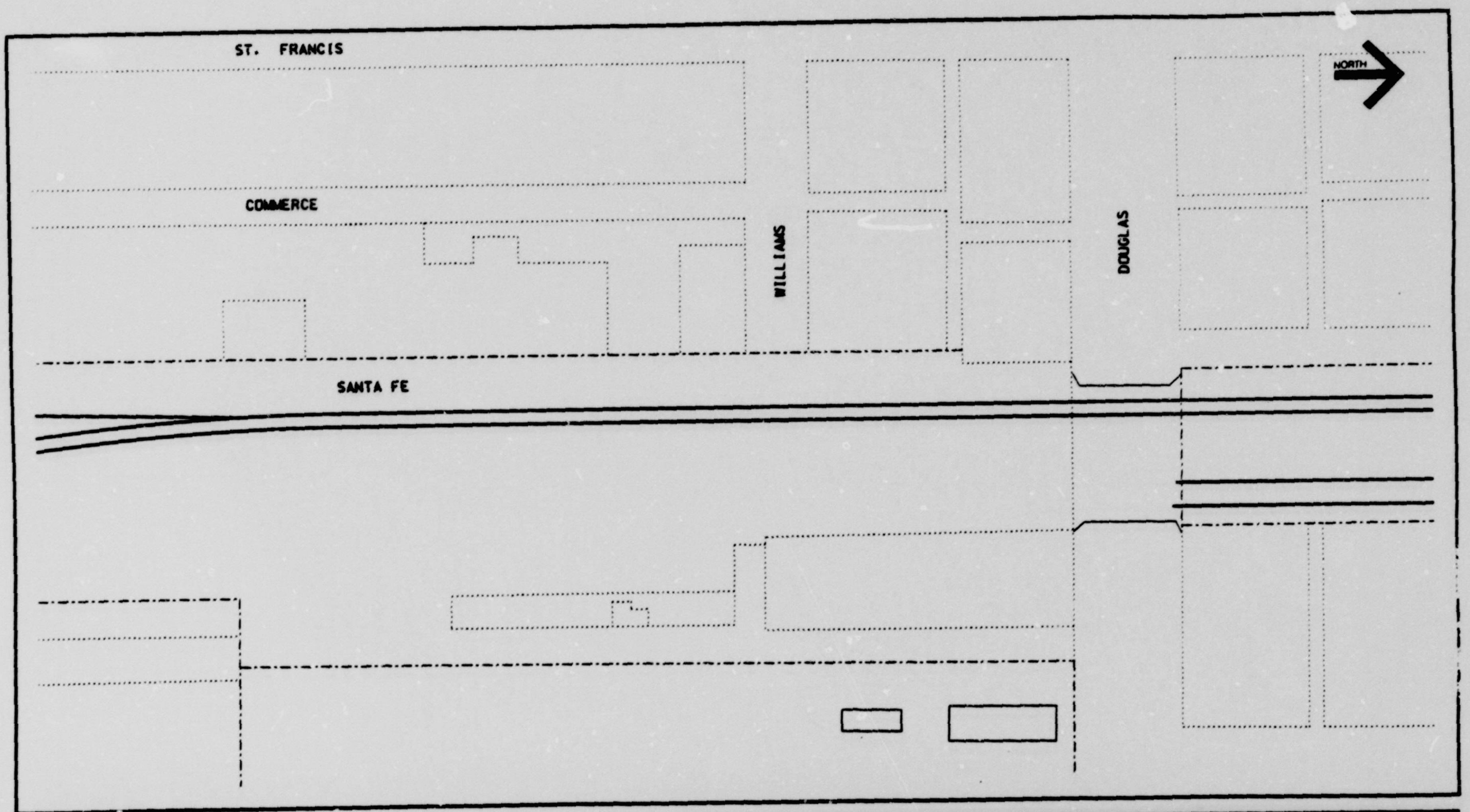
FIGURE L-2 SHEET 10 OF 21
Safety Barriers at UP Rail Line Along Mead



SURFACE TRANSPORTATION BOARD

PRELIMINARY MITIGATION PLAN

FIGURE L-2 SHEET 11 OF 21
Safety Barriers at UP Rail Line Along Mead

September 1997

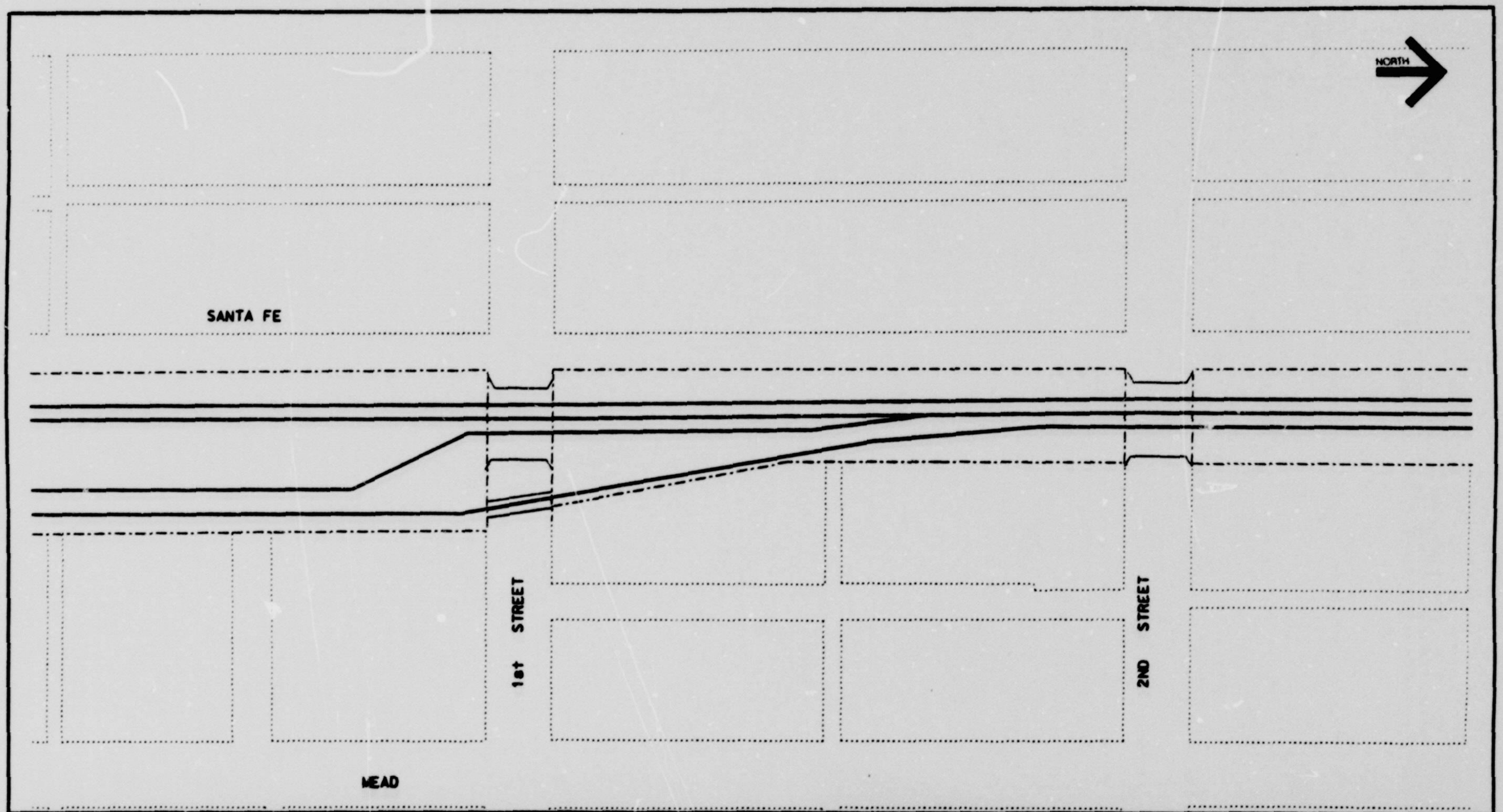


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FIGURE L-2 SHEET 12 OF 21
Safety Barriers at UP Rail Line Along Mead

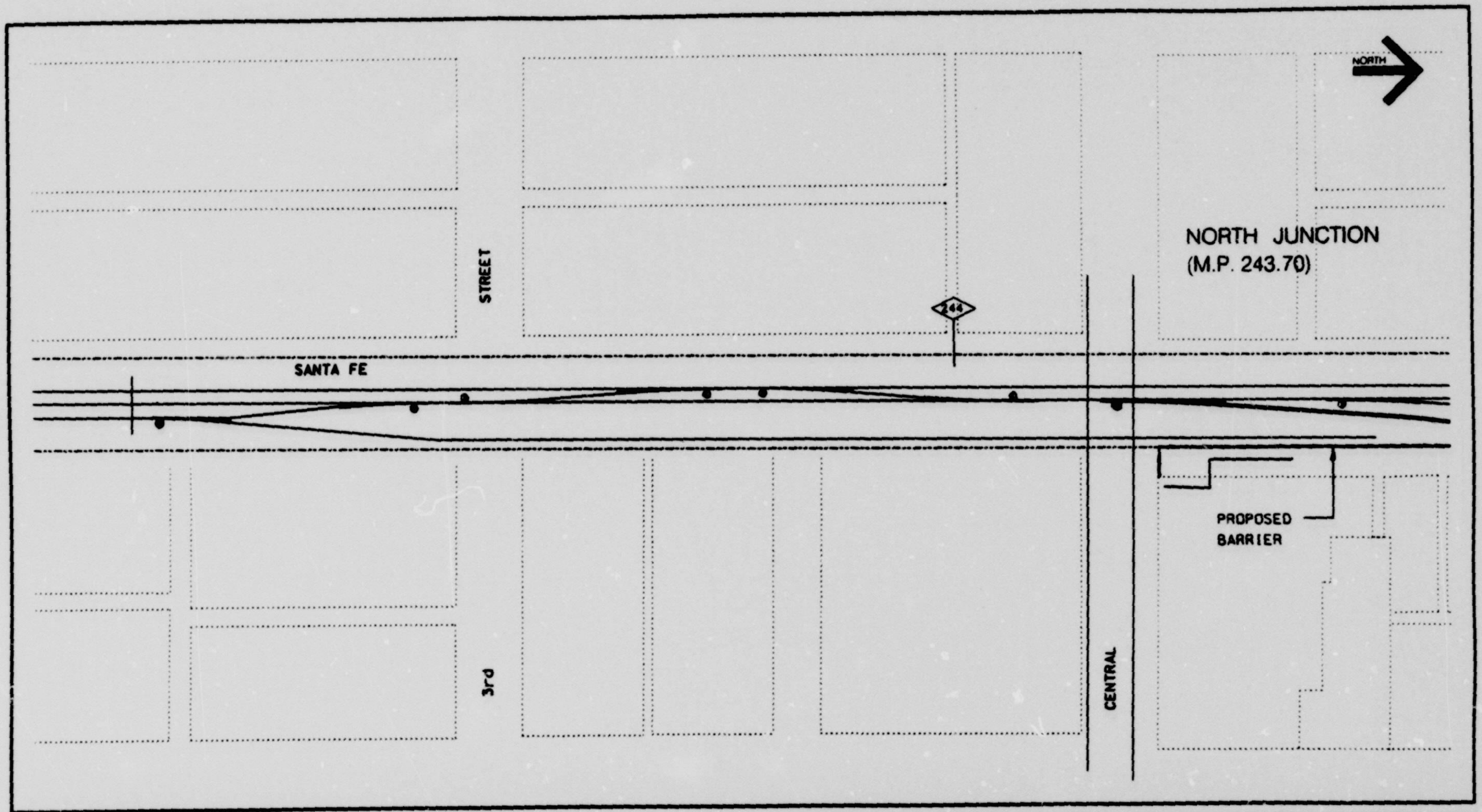

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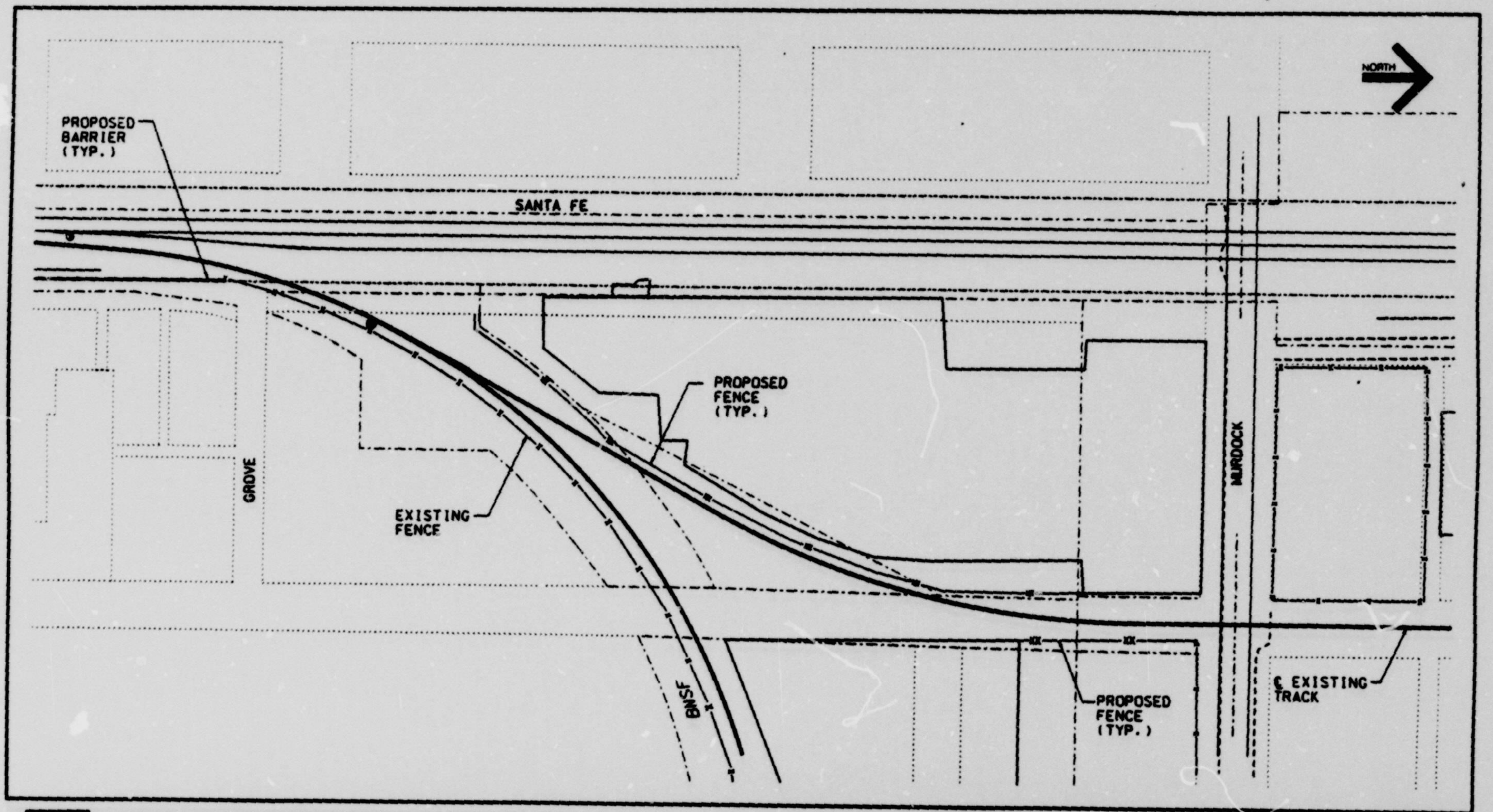
FIGURE L-2 SHEET 13 OF 21

Safety Barriers at UP Rail Line Along Mead



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UP SP WICHITA

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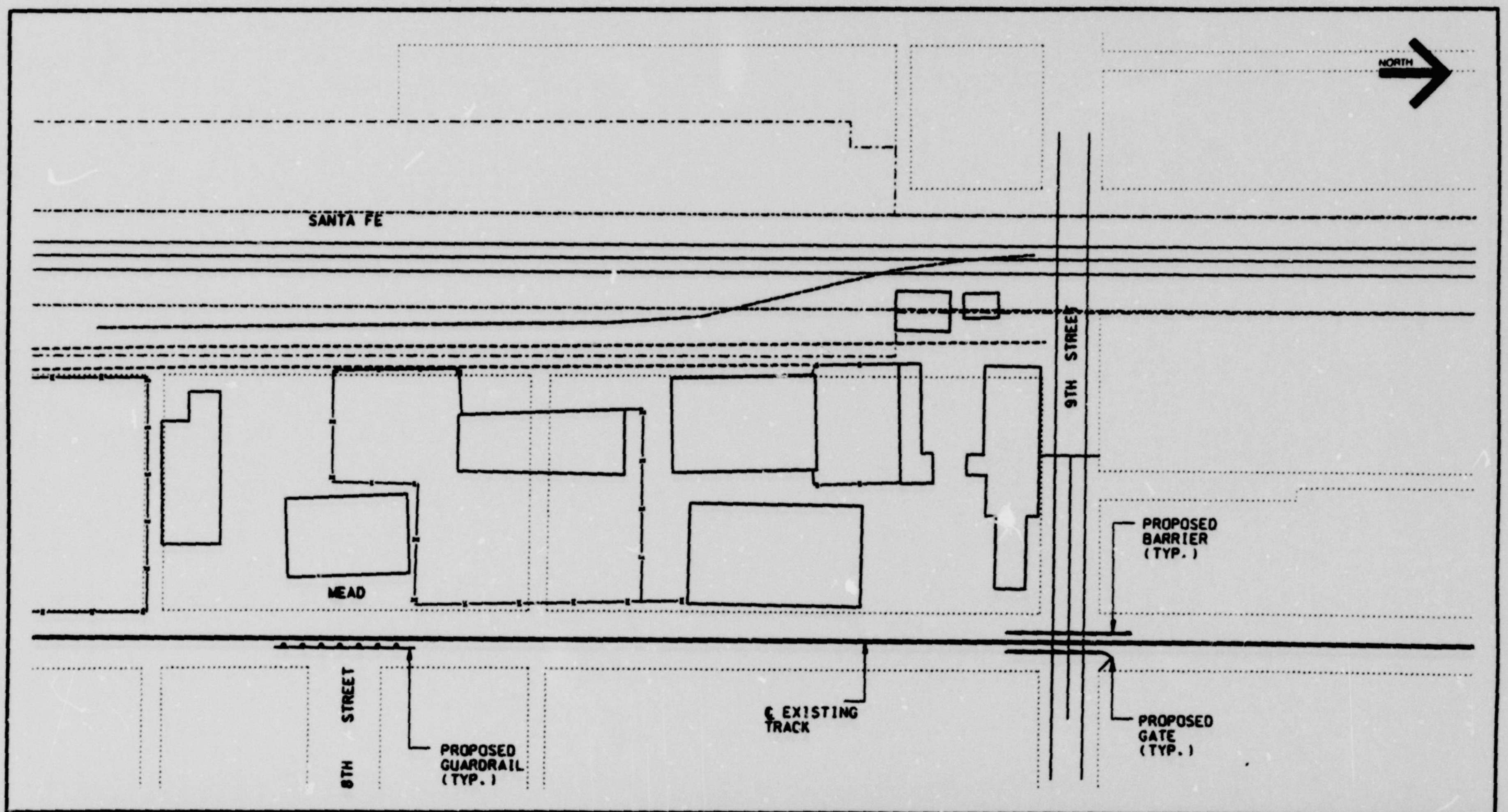
FIGURE L-2 SHEET 14 OF 21

Safety Barriers at UP Rail Line Along Mead



SURFACE TRANSPORTATION BOARD *Section of Environmental Analysis*

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FIGURE L-2 SHEET 15 OF 21
Safety Barriers at UP Rail Line Along Mead

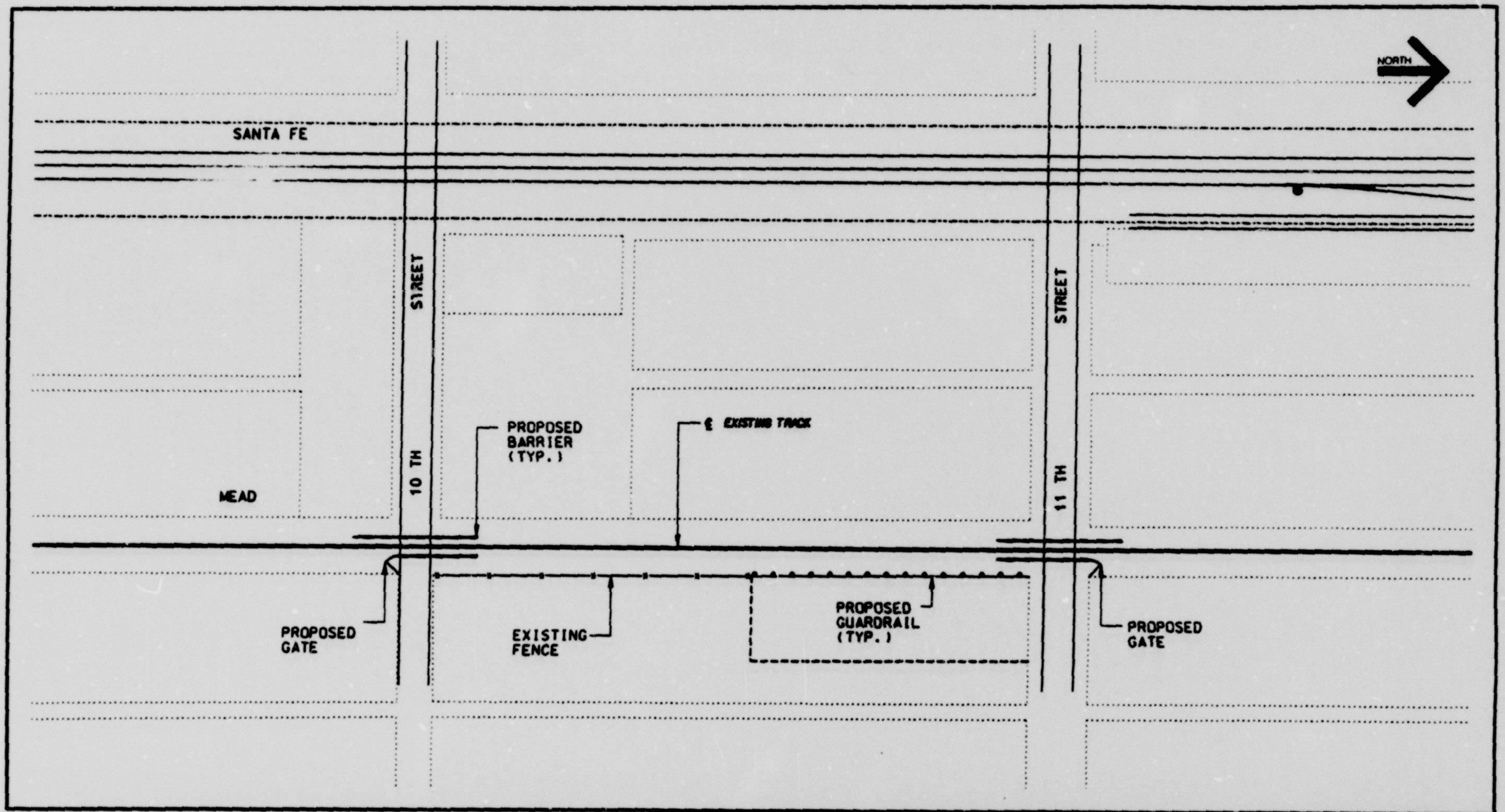

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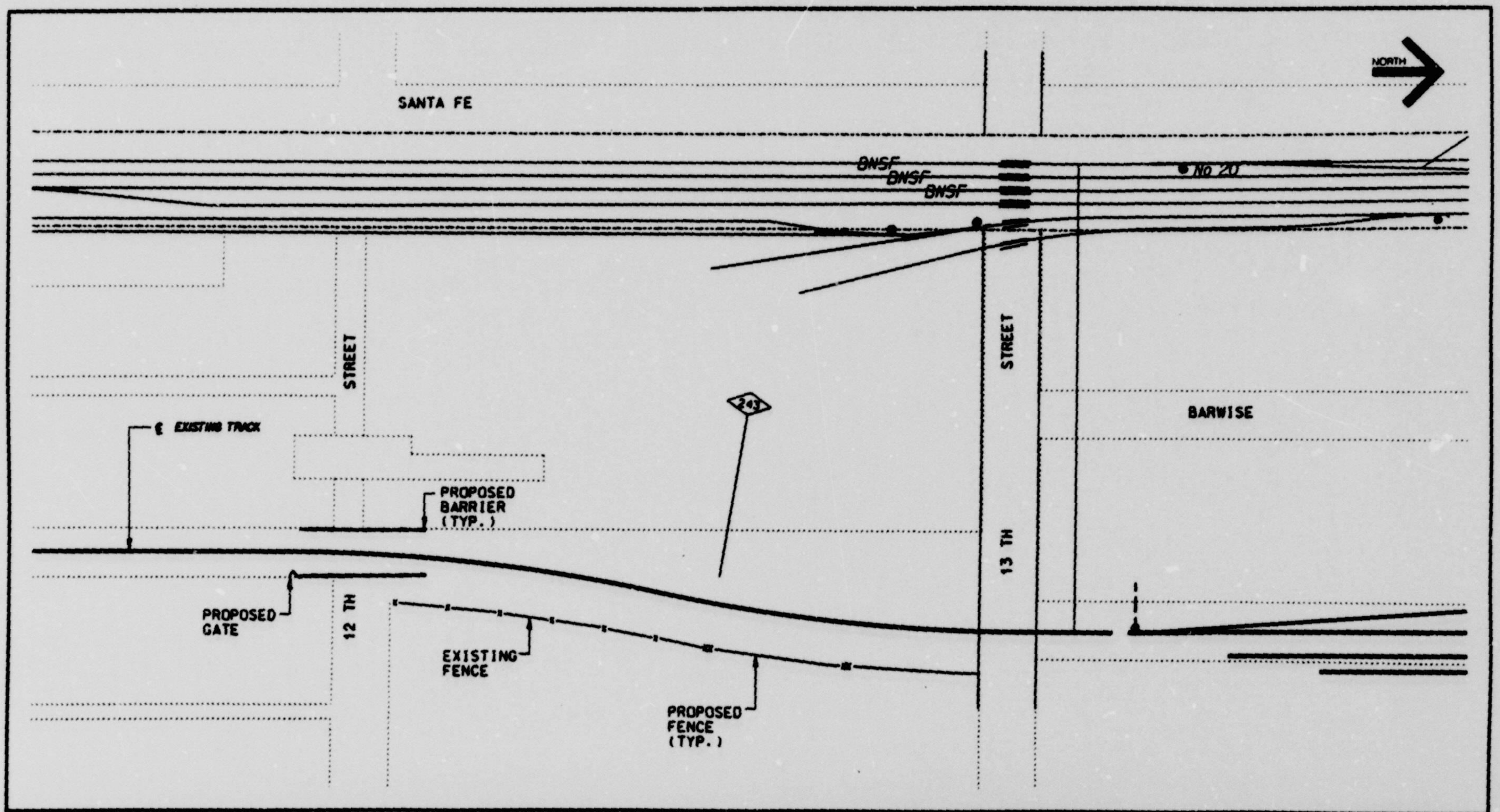
FIGURE L-2 SHEET 16 OF 21
Safety Barriers at UP Rail Line Along Mead

STB FD-32760 ID-181986 9-15-97 K 9/9



SURFACE TRANSPORTATION BOARD

PRELIMINARY MITIGATION PLAN

WICHITA

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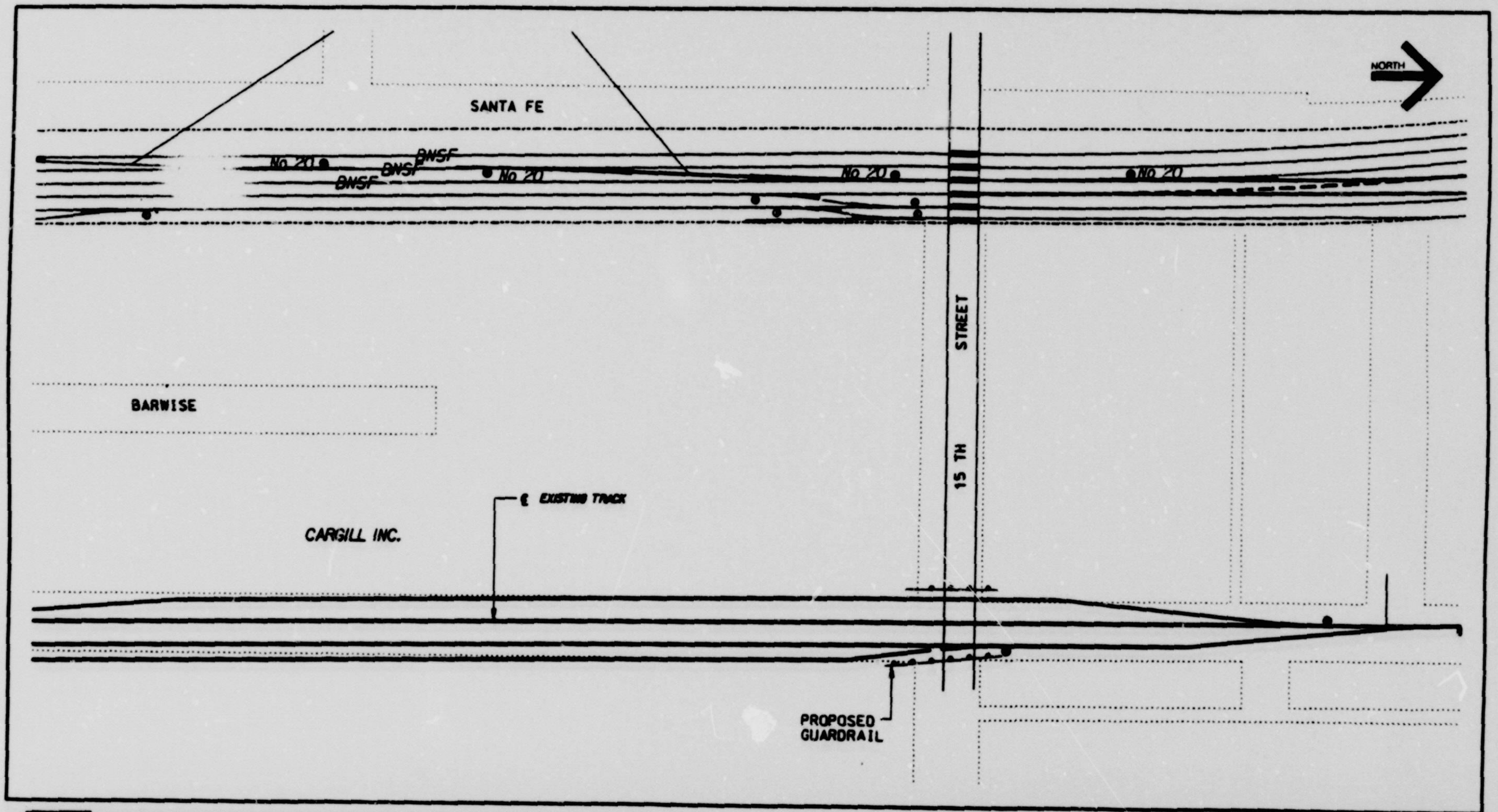
FIGURE L-2 SHEET 17 OF 21
Safety Barriers at UP Rail Line Along Mead



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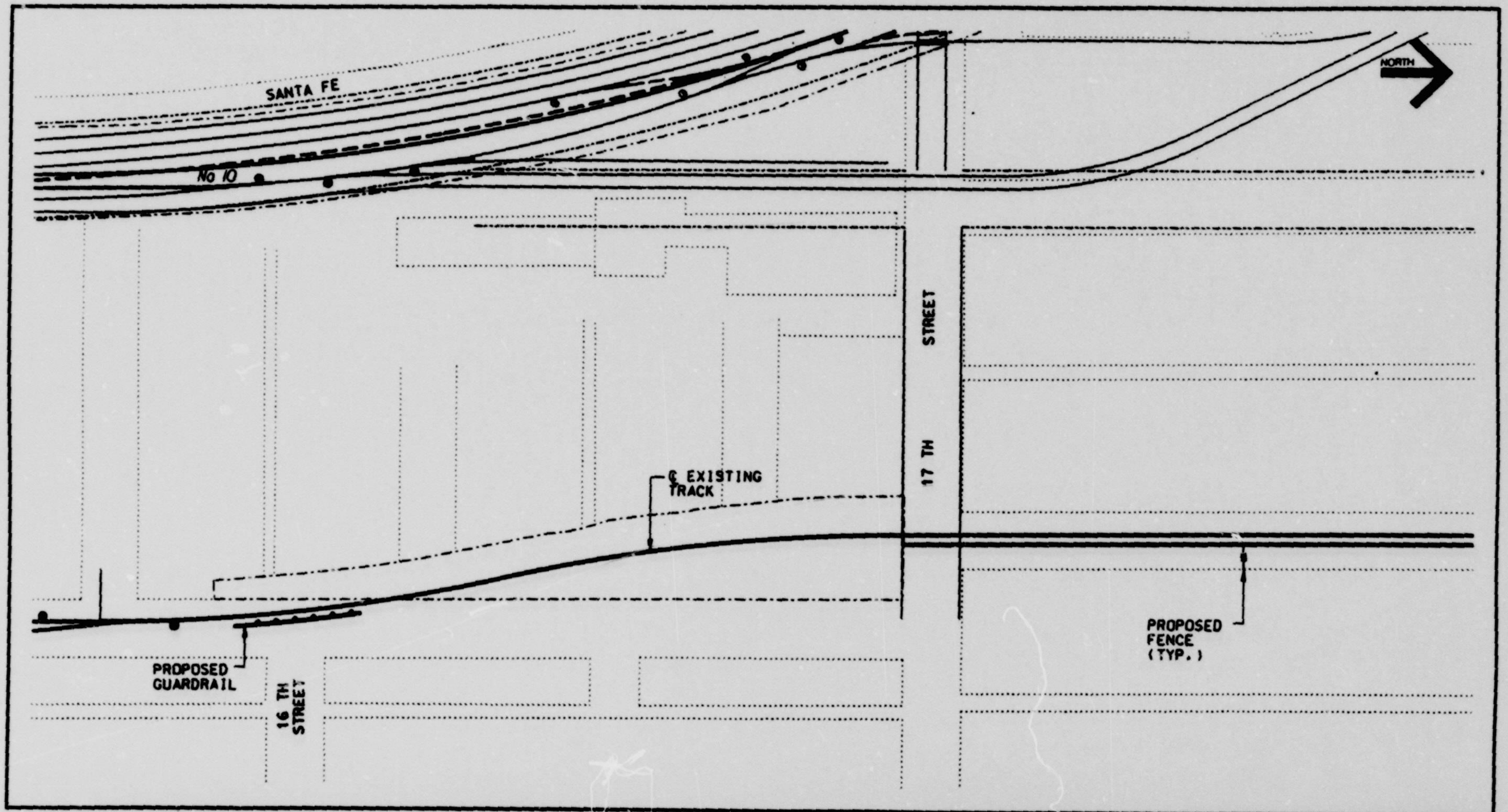
UP SP WICHITA

September 1997

FIGURE L-2 SHEET 18 OF 21
Saftey Barriers at UP Rail Line Along Mead



SURFACE TRANSPORTATION BOARD

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FIGURE L-2 SHEET 19 OF 21
Safety Barriers at UP Rail Line Along Mead

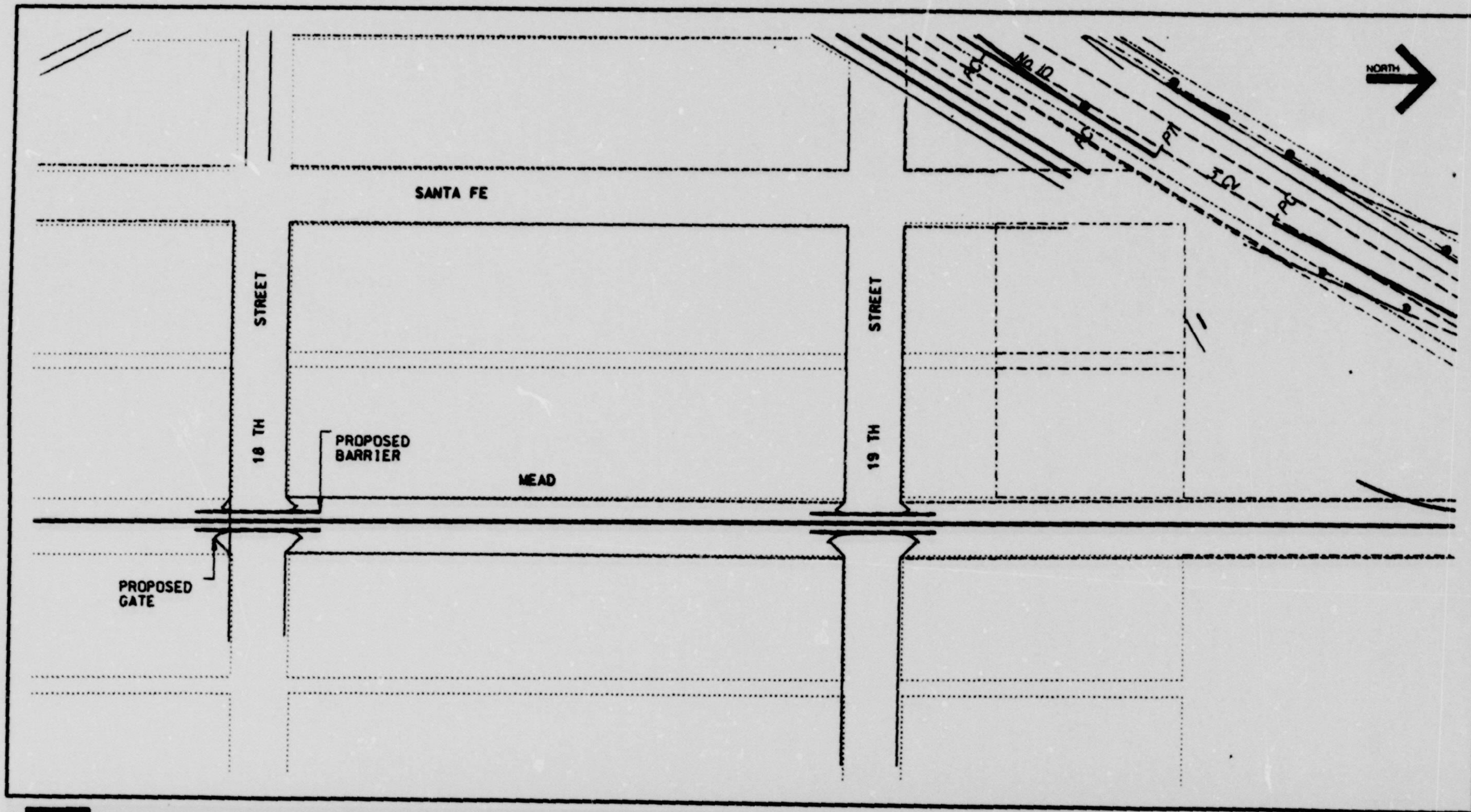

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FIGURE L-2 SHEET 20 OF 21
Safety Barriers at UP Rail Line Along Mead

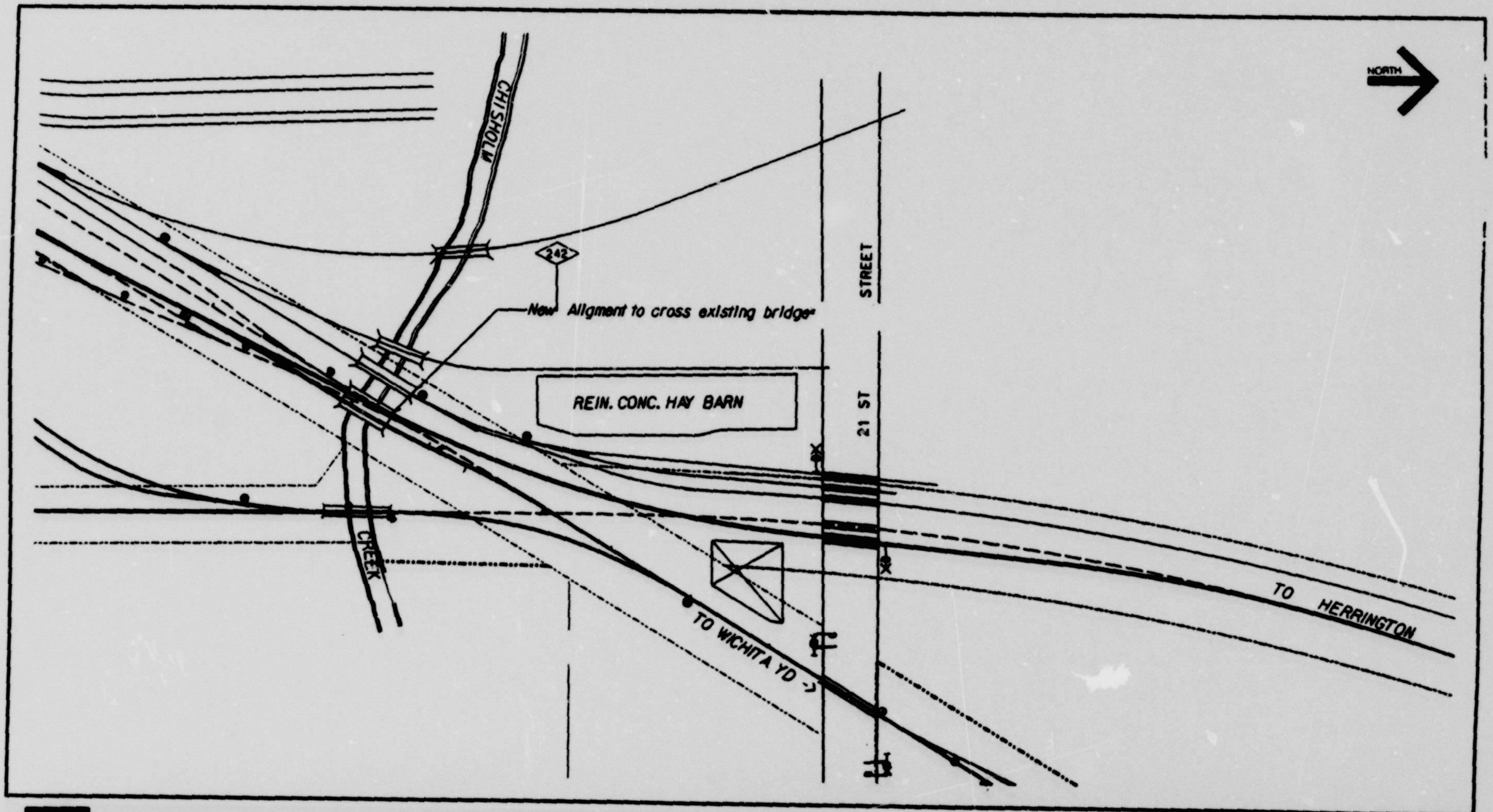

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FIGURE L-2 SHEET 21 OF 21
Safety Barriers at UP Rail Line Along Mead

Appendix M Cost-Estimation Procedures for Conceptual Grade Separations, Traffic Barriers and Street Closures

Appendix M
COST-ESTIMATION PROCEDURES FOR CONCEPTUAL GRADE SEPARATIONS, TRAFFIC BARRIERS, AND STREET CLOSURES

Costs for conceptual grade separations, traffic barriers, and street closures are based upon preliminary conceptual designs. The methods employed for developing costs take into account the preliminary nature of the engineering design in the study and are intended to disclose approximate costs, even though a detailed engineering design exercise has not yet been performed. Cost estimates do not include the acquisition of right-of-way. All costs are in 1997 dollars.

The cost estimates for overpass structures are based upon a unit-cost method that uses the structure footprint area as the primary unit. The unit costs reflect constant access to the entire project site during construction. Except for limited local access, streets would be closed during construction. The cost estimates for adjacent service road and driveway construction are based on a unit-cost method that uses the paved footprint.

The estimates for the cost of underpass structures are based upon preliminary quantity estimates for constructed items. For associated railroad structures, cost estimates are based upon a unit-cost method using the structure footprint area as the primary unit. Unit costs for these structures take into account staged construction procedures so that the railroad, except for minor closures, would remain in service during construction. Associated railroad structures are included as individual cost items in the underpass cost estimates. The cost estimates for adjacent service road and driveway construction are based on a unit-cost method using the paved footprint.

The unit costs used for the grade separations are based on the actual costs for similar projects in the District of Columbia metropolitan area, Virginia, and West Virginia, with modifications for Kansas and the Wichita area. Modifications were derived from standard heavy construction cost guides. A contingency cost of 40 percent of the base costs is included in the estimates. Contingency costs cover differentials between preliminary conceptual designs and final designs, and additional costs due to geotechnical and foundation uncertainties, construction staging, and uncertainties in base unit costs.

Cost estimates for the conceptual grade separations are shown in Table M-1.

Costs for traffic barriers and street closures are based on a unit-cost method that applies the cost per foot for chain-link fence, steel guardrails, and concrete barriers and individual costs for gates. Costs include materials and installation. Unit costs are based on actual costs of similar projects. Quantities were scaled from the best available plans. The cost estimates do not include any costs for utility and roadway modifications, maintenance of traffic, or any other contingencies.

Cost estimates for traffic barriers and street closures are shown in Table M-2.

Table M-1
Preliminary Cost Estimates for Conceptual Grade Separations

Pawnee		Quantity	Unit Price	
.Overpass	Bridge	69600	$95	$6,612,000
	Service road & other pavings	54000	$20	$1,080,000
	Engineering and Constr. Mgmnt			$2,000,000
	Utility Relocation			$300,000
	Traffic Management			$100,000
			Subtotal:	$10,092,000
	Contingency			1.4
			Total:	$14,128,800
Underpass	RR Bridge	850	$210	$178,500
	Mead Ave. Bridge	1500	$150	$225,000
	Bracing	13750	$17	$233,750
	Ret. Walls	13750	$26	$357,500
	Excavation	26481	$80	$2,118,480
	Waterproof	4	$123,106	$492,424
	Pvt, crb & gtr	32500	$10	$325,000
	Service road & other paving	48000	$20	$960,000
	Sump & drain	1	$200,000	$200,000
	Engineering and Constr. Mgmnt			$1,200,000
	Utility Relocation			$800,000
	Traffic Management			$100,000
			Subtotal:	$7,190,654
	Contingency			1.4
			Total:	$10,066,916

Central		Quantity	Unit Price	
Overpass	Bridge	101300	$95	$9,623,500
	Road relocation & other paving	9000	$20	$180,000
	Engineering and Constr. Mgmnt			$2,800,000
	Utility Relocation			$1,000,000
	Traffic Management/Access			$3,000,000
			Subtotal:	$12,623,500
	Contingency			1.4
			Total:	$17,672,900
Underpass	RR Bridge 1	2750	$210	$577,500
	RR Bridge 2	850	$210	$178,500
	Bracing	48750	$17	$828,750
	Ret. Walls	48750	$26	$1,267,500
	Excavation	47222	$80	$3,777,760
	Waterproof	4	$386,364	$1,545,456
	Pvt, crb & gtr	102000	$10	$1,020,000
	Service road & other paving	72000	$20	$1,440,000
	Sump & drain	2	200000	$400,000
	Engineering and Constr. Mgmnt			$2,800,000
	Utility Relocation			$1,000,000
	Traffic Management/Access			$2,000,000
			Subtotal:	$16,635,466
	Contingency			1.4
			Total:	$23,289,652

Table M-1 (Cont.)

13th Street

		Quantity	Unit Price	
Overpass	Bridge	114000	$95	$10,830,000
	Service road & other paving	45000	$20	$900,000
	Engineering and Constr. Mgmnt			$2,500,000
	Utility Relocation			$300,000
	Traffic Management/Access			$2,000,000
			Subtotal:	$12,830,000
				1.4
	Contingency		Total:	$17,962,000
Underpass	RR Bridge 1	2750	$210	$577,500
	RR Bridge 2	850	$210	$178,500
	RR Bridge 3	850	$210	$178,500
	Bracing	50000	$17	$850,000
	Ret. Walls	50000	$26	$1,300,000
	Excavation	46296	$80	$3,703,680
	Waterproof	4	$386,364	$1,545,456
	Pvt, crb & gtr			$1,000,000
	Service road & other paving	72000	$20	$1,440,000
	Sump & drain			$500,000
	Engineering and Constr. Mgmnt			$2,500,000
	Utility Relocation			$800,000
	Traffic Management/Access			$2,000,000
			Subtotal:	$16,573,636
				1.4
	Contingency			$23,203,080

21st Street

		Quantity	Unit Price	
Overpass	Bridge	177600	$95	$16,872,000
	Service road & other paving	60000	$20	$1,200,000
	Engineering and Constr. Mgmnt			$2,500,000
	Utility Relocation			$1,500,000
	Traffic Management/Access			$2,000,000
			Subtotal:	$18,872,000
				1.4
	Contingency		Total:	$26,420,800
Underpass	Underpass is not recommended for this street because two creeks intersect it at the location of the underpass and can cause underground water problems for construction.			

Table M-2. Preliminary Cost Estimates
Safety Barriers Along Mead and Street Closures

Item	Quantity	Unit Length	Unit Price	Cost
Traffic Safety Barriers:				
Chain-Link Fence	5,150	foot	$ 15.00	$ 77,250
Guardrail	2,270	foot	$ 30.00	$ 68,100
Gates	16	each	$300.00	$ 4,800
Total				$150,150
Street Closures:				
Concrete Jersey Barriers	3,880	foot	$ 60.00	$232,800

Appendix N List of Acronyms and Abbreviations

Appendix N

LIST OF ACRONYMS AND ABBREVIATIONS

AAR	American Association of Railroads
ABS	Automatic Block Signal System
ADT	Average Daily Traffic
AHS	Automated Horn System
ANSI	American National Standards Institute
AQCR	Air Quality Control Region
AQMD	Air Quality Management District
BIA	Bureau of Indian Affairs
BMPs	Best Management Practices
BN	Burlington Northern Railroad Company
BNSF	The railroad company created by the merger of the holding companies of BN and Santa Fe
Board	Surface Transportation Board
CAAA	Clean Air Act and Amendments
CAD	Computer Aided Dispatching
CDBG	Community Development Block Grant Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHP	Comprehensive Highway Program
CIP	Capital Improvement Program or Plan
CKRY	Central Kansas Railway
CMAQ	Congestion Management and Air Quality Improvement
CO	Carbon Monoxide
CSX	CSX Transportation, Inc.
CTC	Centralized Traffic Control
db	Decibel
dBA	Decibels (of sound) A range
DNL	Day-night equivalent sound level (also L_{dn})
DOT	Department of Transportation
EA	Environmental Assessment
EFI	Electronic Fuel Injection
EIS	Environmental Impact Statement
EMS	Emergency Medical Service
EPA	Environmental Protection Agency
ER	Environmental Report
ERNS	Emergency Response Notification System
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration

Appendix N

LIST OF ACRONYMS AND ABBREVIATIONS

FTA	Federal Transit Administration
GIS	Geographic Information Systems
HC	Hydrocarbons (in air)
HUD	Department of Housing and Urban Development
ICC	Interstate Commerce Commission (former licensing agency for the proposed merger; merger approval authority now with the Surface Transportation Board)
ISTEA	Intermodal Surface Transportation Efficiency Act
ITS	Intelligent Transportation System
KSW	Kansas Southwestern Railway
L_{eq}	Equivalent Sound Level
L_{dn}	Day-Night Equivalent Sound Level
L_{max}	Maximum sound level during train passby
LNG	Liquefied Natural Gas
LOS	Level of Service
MAPD	Wichita-Sedgwick County Metropolitan Area Planning Department
MBT	Maximum Brake Torque
MOU	Memorandum of Understanding
MP	Mile Post
mph	Miles Per Hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act of 1966
NHS	National Highway System
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NS	Norfolk Southern Railway Company
O_3	Ozone
OKT	OKT subdivision, Union Pacific Railroad
OSHA	Occupational Safety and Health Administration
Pb	Lead
PDEA	Preliminary Draft Environmental Assessment
ppm	Parts Per Million
PPV	Peak Particle Velocity

Appendix N

LIST OF ACRONYMS AND ABBREVIATIONS

Post EA	Post Environmental Assessment
PM_{10}	Particulate Matter (under 10 microns in diameter)
PMP	Preliminary Mitigation Plan
ROW	Right-of-way
SAD	Special Assessment District
SCAQMD	South Coast Air Quality Management District
SCR	Selective Catalytic Reduction
SEA	Section of Environmental Analysis
SEL	Source Sound Exposure Level at 100 Feet
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxides
SP	Southern Pacific Railroad Company
STB	Surface Transportation Board
STP	Surface Transportation Program
TIP	Transportation Improvement Program
TSP	Total Suspended Particulates (particulate matter)
UP	Union Pacific Railroad
UP/SP	The combined railroad system created by the merger of the holding companies of UP and SP
USC	United States Code
VdB	Velocity Decibel
VOC	Volatile Organic Compound
WMTA	Wichita Metropolitan Transit Authority
WTA	Wichita Terminal Association
WUT	Wichita Union Terminal

Appendix O Glossary

Appendix O

GLOSSARY

automatic block signals	A system of consecutive signals and blocks (i.e., lengths of track) whereby a signal is placed at the entrance of each block and that signal indicates the condition of the block.
ambient noise	Background noise.
ballast	Top surface of rail bed, usually composed of aggregate (i.e., small rocks and gravel).
best management practices (BMPs)	Techniques recognized as very effective in providing environmental protection.
block	A length of track having defined limits.
borrow material	Earthen material used to fill depressions to create a level right-of-way.
bulk train	Also known as unit train. A solid consisting of single non-breakable commodity (e.g., coal, grain, semi-finished steel, sulfur, potash, orange juice) being transported at a trainload rate.
centralized traffic control (CTC)	A method of train control whereby railroad signals convey train movement authority and train routing is controlled from a central location. In usual practice, the dispatcher views a display showing the track layout and location of trains as they move across the territory. Train routing is controlled from a work station where the dispatcher activates controls that move the position of switches in the field.
consist	The make-up of a train, usually referring to the number of cars.
construction footprint	The area at a construction site subject to both permanent and temporary disturbances by equipment and personnel.
criteria pollutant	Any of six substances (lead, carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate mater) regulated under the Clean Air Act, for which areas must meet national air quality standards.
dBA	"A-weighted" decibels; a single-number measure of sound severity that accounts for the various frequency components in a way that corresponds to human hearing.

Appendix O

GLOSSARY

decibel	A logarithmic scale that comprises over one million sound pressures audible to the human ear over a range from 0 to 140, where zero decibels represents a reference sound level necessary for a minimum sensation of hearing and 140 represents the level at which pain occurs.
flat yard	A system of relatively level tracks within defined limits provided for making up trains, storing cars, and other purposes which require a locomotive to move or switch cars from one track to another.
haulage right	The limited right of one railroad to operate trains over the designated lines of another railroad.
interlocking	An arrangement of switch, lock, and signal appliances interconnected so that their movements succeed each other in a predetermined order, enabling a moving train to switch onto adjacent rails. It may be operated manually or automatically.
intermodal facility	A site or hub consisting of tracks, lifting equipment, paved areas, and a control point for the transfer (e.g., receiving, loading, unloading, and dispatching) of intermodal trailers and containers between rail and highway or rail and marine modes of transportation.
intermodal train	A train consisting or partially consisting of highway trailers and containers or marine containers being transported for the rail portion of a multimodal movement on a time-sensitive schedule; also referred to as a piggyback, TOFC (Trailer on Flat Car), COFC (Container on Flat Car), and double stacks (for containers only).
L_d	Level of noise (measured in decibels) averaged over the "daytime" period (7 a.m. - 10 p.m.).
L_{dn}	Nighttime noise level (L_n) adjusted to account for the perception that a noise level at night is more bothersome than the same noise level would be during the day.
Level of Service (LOS)	A measure of the functionality of an intersection that factors in vehicle delay, intersection capacity, and effects to the street/highway network (rated A through F).

Appendix O

GLOSSARY

lift	An intermodal trailer or container lifted onto or off of a rail car. For calculations, lifts are used to determine the number of tracks using intermodal facilities.
local freight train	Serves local sidings in a designated territory.
locomotive, road	One or more locomotives (or engines) designed to move trains between yards or other designated points).
locomotive, switching	Locomotive (or engine) used to switch cars in a yard, industry, or other area where cars are sorted, spotted (placed at a shipper's facility), pulled (removed from a shipper's facility), and moved within a local area.
merchandise train	A train consisting of single and/or multiple car shipments of various commodities.
mitigation	Action to prevent or lessen negative effects.
nonattainment	An area that does not meet NAAQS specified under the Clean Air Act.
non-point source discharge	Pollution not associated with a specific outfall location, such as a sewer pipe.
passby	The passing of a train past a specific reference point
pick up	To add one or more cars to a train from an intermediate (non-yard) track designated for the storage of cars.
quiet zone	A track segment at least one-half mile long where the sounding of train horns approaching grade crossings is not required.
rail spur	A track that diverges from a main line, also known as a spur track or rail siding, which typically serves one or more industries.
rail banking	A set-aside of abandoned rail corridor for recreational and/or transportation uses, including reuse for rail.
receptor/receiver	A land use or facility where sensitivity to noise or vibration is considered.

Appendix O

GLOSSARY

right-of-way	The right held by one person over the lands of another for a specific use; rights of tenants are excluded. The strip of land for which permission has been granted to build and maintain a linear structure, such as a road, railroad, or pipeline.
set out	To remove one or more cars from a train at an intermediate (non-yard) location such as a siding, interchange track, spur track, or other track designated for the storage of cars.
switching	The act of moving freight cars between a shipper and yard; movement of cars within a yard.
through freight train	Train that operates between major terminals.
trackage rights	The right or combination of rights of one railroad to operate over the designated trackage of another railroad including, in some cases: the right to operate trains over the designated trackage; the right to interchange with all carriers at all junctions; and the right to build connections or additional tracks in order to access other shippers or carriers.
unit train	A train consisting of cars carrying a single commodity (e.g., coal, ore, sulphur) that cycles between origin and destination as one body.
wye track	A principal track and two connecting tracks arranged like the letter "Y" on which locomotives, cars, and trains may be turned.

Appendix P List of Preparers

Appendix P
LIST OF PREPARERS

The following individuals participated in conducting the Wichita Mitigation Study and preparing this Preliminary Mitigation Plan:

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Duncan W. Allen	Railroad Operations Safety
Ken Briers	Railroad Operations
Lawrence M. Engleman	Emergency Vehicle Access
Elliott Mandel	Grade Separation Engineering
G. D. Chopra	Grade Separation Engineering
Prakash Patel	Safety Barrier Engineering
Hon Vinh	Railroad Signals and Warning Devices

181986

Public Affairs Management

Bonnie Nixon	Deputy Project Director
Charles Gardiner	Community Coordinator
Olivia Perreault	Outreach Coordinator
Beth Niestat	Editor
Nancy Roberts	Editor

Other Consultants

David E. Coate, Acentech Incorporated	Consultant, Noise
Christopher M. Maxon, Acentech Incorporated	Consultant, Noise
Philip A. Praino, Acentech Incorporated	Consultant, Noise
Daniel R. Luscher, Acurex Environmental Corp.	Consultant, Air Quality
Douglas Coleman, Acurex Environmental Corp.	Consultant, Air Quality
Robert C. Schaevitz, Decision Economics, Inc.	Consultant, Financing and Funding
Barry P. Steinberg, Kutak Rock	Consultant, Legal Issues
Phil Olekszyk, World Wide Rail	Consultant, Safety

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code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
			Public Record			Surface Transportation Board	1925 K Street NW, 5th Floor	Washington	DC	20423		
SPEC	ASSOC.	WMCO	Elizabeth	Bishop	Executive Director	Wichita Independent Neighborhoods, Inc.	3995 East Harry	Wichita	KS	67218	(316) 685-6300	(316) 685-6335
LA		WMCA	Mark	Borst	Deputy Director	Sedgwick Co. Bureau of Public Services	1250 South Seneca	Wichita	KS	67213-4498	(316) 383-7901	(316) 263-9241
ST, HD			Philip	Braum	Wichita Mitigation Study Team	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20006		
ST, HD			Ken	Briers	Railroad Operations	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
EO	USEN		Sam	Brownback	Senator	US Senate	SH-303 Hart Senate Office Building	Washington	DC	20510	(202) 224-6521	(202) 228-1265
SA		PR	E. Dean	Carlson	Secretary of Transportation	Kansas Department of Transportation	915 Harrison, 7th floor	Topeka	KS	66612	(913) 296-4286	(913) 286-0287
SA		WMCA	Al	Cathcart	Coordinating Engineer	Kansas Department of Transportation	Docking State Office Building, 8th	Topeka	KS	66612	(913) 296-3529	(913) 296 8399
EO	LO		Bill	Cather	Council Member	Wichita City Council	455 North Main St., 1st Floor	Wichita	KS	67202	(316) 268-4331	(316) 268-4333
LA			Chris	Cherches	City Manager	City of Wichita	455 North Main St.	Wichita	KS	67202	(316) 268-4351	
EO	LO		Joan	Cole	Council Member	Wichita City Council	455 North Main St., 1st Floor	Wichita	KS	67202	(316) 268-4331	(316) 268-4333
MED	NP		Jim	Cross	Reporter	Wichita Eagle	825 East Douglas St.	Wichita	KS	67201	(316) 268-6233	(316) 268-6627
ST, HD			Mike	Dalton	Wichita Mitigation Study Team	Surface Transportation Board	1925 K street NW, 5th Floor	Washington	DC	20423		
SPEC	BE	WMCO	Pamela	Doonan	VP & COO	Kansas World Trade Center	350 West Douglas	Wichita	KS	67202	(316) 268-1170	(316) 262-3585
ST, HD			Larry	Engleman	Emergency Vehicle Access	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
EO	LO		Gregory M.	Ferris	Council Member (District V)	Wichita City Council	455 North Main St., 1st Floor	Wichita	KS	67202	(316) 268-4331	(316) 268-4333
EO	LO.		Rick	Fleming	Associate Counsel to the Governor	Kansas Office of the Governor	State Capitol, 2nd Floor	Topeka	KS	66612	(913) 296-4052	(913) 296-7973
EO	LO	GTF	Nola	Foulston	District Attorney	Sedgwick County District Attorney's Office	535 North Main Annex	Wichita	KS	67203	(316) 383-7713	
EO	LO		Bill	Gale	Council Member (District IV)	Wichita City Council	455 North Main St., 1st Floor	Wichita	KS	67202	(316) 268-4331	(316) 268-4333
ST			Charles	Gardiner	Wichita Mitigation Study Team	Public Affairs Management	101 The Embarcadero, Suite 210	San	CA	94105	(415) 989-1446	
SPEC	ASSOC.	WMCO	Jeanne	Goodvin	Director	Wichita Citizen Participation Organization	455 North Main St., 13th Floor	Wichita	KS	67202	(316) 268-4516	(316) 268-4519
EO	LO		Bill	Graves	Governor	State of Kansas	2nd Floor, State Capitol	Topeka	KS	66612-1590	(913) 296-3232	
EO	LO.		Ron	Green	Director of Policy Research	Kansas Office of the Governor	State Capitol, Room 212 S	Topeka	KS	66612	(913) 296-3232	(913) 296-7973
EO	LO		Betsy	Gwin	Commissioner	Sedgwick County Commission	525 North Main St., 3rd Floor	Wichita	KS	67202	(316) 383-7411	
EO	LO		Bill	Hancock	Commissioner	Sedgwick County Commission	525 North Main St., 3rd Floor	Wichita	KS	67202	(316) 383-7411	

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code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
ST, HD			Mel	Harvey	Wichita Mitigation Study Team	DeLeuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
RR		PR	J. Michael	Hemmer	Attorney	Covington & Burling	1201 Pennsylvania Ave. NW	Washington	DC	20044	(202) 662-5578	(202) 662-6291
LA		WMCO	Laura	Hill	City Clerk	City of Kechi	[illegible] West Kechi Rd.	Kechi	KS	67067	(316) 744-9287	(316) 744-9636
SPEC	ASSOC,	WMCA	Cathy	Holdeman		Wichita Citizen Participation Organization	[illegible] Main St., 13th Floor	Wichita	KS	67202	(316) 268-4516	(316) 268-4519
ST, HD			Elaine	Kaiser	Section Chief, Program Director	Surface Transportation Board	1925 K St[illegible]	Washington	DC	20423		
LA			Steven	Kalish	Attorney	McCarthy, Sweeney & Harkaway, P.C.	1750 Pennsylvania [illegible]	[illegible]ngton	DC	20006	(202) 393-5710	(202) 393-5721
EO	LO		Sheldon	Kamen	Council Member (District II)	Wichita City Council	455 North Main St., 1st Floor	[illegible]	KS	67202	(316) 268-4331	(316) 268-4333
ST, HD			Andrew	Kilpatrick	Traffic and Grade Crossing Safety	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
ST, HD			Evelyn	Kitay	Legal Counsel	Surface Transportation Board	1925 K Street NW, 5th Floor	Washington	DC	20423		
EO	LO	GTF	Bob	Knight	Mayor	City of Wichita	455 North Main St.	Wichita	KS	67202	(316) 268-4331	(316) 268-4333
SPEC	BE	WMCA	Bernie	Koch	VP Government Relations	Wichita Area Chamber of Commerce	350 West Douglas	Wichita	KS	67202	(316) 265-7502	
LA		WMCO	Michael	Lindebak	City Engineer	Wichita Public Works Department	455 N. Main St., 7th Floor	Wichita	KS	67202	(316) 268-4266	(316) 268-4114
ST, HD			Elliot	Mandel	Engineering	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
LA		WMCO	Mike	McElroy	Captain	Haysville Police Department	200 West Grand	Haysville	KS	67060	(316) 524-4243	(316) 524-6764
EO	LO		Melody	Miller	Commissioner	Sedgwick County Commission	525 North Main St., 3rd Floor	Wichita	KS	67202	(316) 383-7411	
LA		WMCA	Carol	Neugent	Director of Governmental Services	City of Haysville	200 W. Grand	Haysville	KS	67060	(316) 524-3243	
ST			Bonnie	Nixon	Deputy Project Director	Public Affairs Management	101 The Embarcadero, Suite 210	San	CA	94105	(415) 989-1446	
EO	LO		Tim	Norton	Mayor	City of Haysville	200 W. Grand Ave.	Haysville	KS	67060	(316) 524-3243	
RR			Thomas	Ogee	Chief Engineer	Union Pacific Railroad	1416 Dodge St., Room 1030	Omaha	NE	68179-1000	(402) 271-4946	(402) 271-6674
ST			Phil	Olekszyk	Consultant	World Wide Rail	3 Emerson Road	Severna	MD	21146	(410) 544-0053	(410) 544-7242
ST, HD			Ed	Papazian	Traffic and Grade Crossing Safety	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
EO	LO		Ed	Parker	Mayor	City of Kechi	200 W. Kechi	Kechi	KS	67067	(316) 744-9287	(316) 744-9636
ST, HD			Prakash	Patel	Engineering	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
ST			Olivia	Perreault	Wichita Mitigation Study Team	Public Affairs Management	101 The Embarcadero, Suite 210	San	CA	94105		
SPEC	ASSOC,	WMCO	Jane	Richards		Project Freedom Family & Youth Coalition	3995 East Harry	Wichita	KS	67218	(316) 685-6300	(316) 685-6335

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code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
EO	USEN		Pat	Roberts	US Senator	US Senate	SH-302 Hart Senate Office Building	Wasington	DC	20510	(202) 224-4774	(202) 224-3514
EO	LO		George	Rogers	Council Member (District 1)	Wichita City Council	455 North Main St., 1st Floor	Wichita	KS	67202	(316) 268-4331	(316) 268-4333
SA		WMCO, PJohn Jay		Rosacker	Manager	Kansas Department of Transportation	217 SE 4th St., 2nd Floor	Topeka	KS	66603	(913) 296-0342	
SPEC	ASSOC.	WMCA	James	Roseboro		Northeast Heights Neighborhood Association	4518 Greenbriar	Wichita	KS	67220	(316) 651-0522	
MED	TV		Bill	Roy		KWCH - TV 12	285 East 37 North	Wichita	KS	67219	(316) 838-1212	
EO	USC		Jim	Ryun	US Representative	US House of Representatives	511 Cannon House Office Bldg.	Washington	DC	20515	(202) 225-6601	(202) 225-7986
EO	LO		Mark	Schroeder	Commissioner	Sedgwick County Commission	525 North Main St., 3rd Floor	Wichita	KS	67202	(316) 383-7411	
LA		WMCA	Vic C.	Shen	Senior Planner	Wichita & Sedgwick Co. Metropolitan	455 North Main St., 10th Floor	Wichita	KS	67202	(316) 268-4391	(316) 268-4390
EO	LO	GTF	Gary	Sherrer	Lt. Governor	State of Kansas	State Capitol, Room 222 S	Topeka	KS	66612	(913) 296-2213	(913) 296-5669
RR			Cliff	Shoemaker	Director, Industry & Public Projects	Union Pacific Railroad	1416 Dodge St.	Omaha	NE	68179	(402) 271-4357	(402) 271-6674
LA		WMCO	David	Spears	Director of Engineering	Bureau of Public Services	1250 South Seneca	Wichita	KS	67213	(316) 383-7901	(316) 263-9241
ST, HD			Barry	Steinberg	Consultant, Legal issues	Kutak Rock	1101 Connecticut Ave. NW, Suite	Washington	DC	20036-4374		
LA		WMCO, FBill		Stockwell	Chief Planner	Wichita & Sedgwick Co. Metropolitan Area	455 North Main St., 10th Floor	Wichita	KS	67202	(316) 268-4490	(316) 268-4390
ST		GTF	Michelle	Taylor		Surface Transportation Board	1925 K Street NW, Suite 450	Washington	DC	20006	(202) 955-1430	
LA		WMCA	Michael	Thull	Civil Engineer	Wichita Public Works Department	455 North Main St.	Wichita	KS	67202	(316) 268-4598	(316) 268-4114
EO	USC		Todd	Tiahrt	US Representative	US House of Representatives	428 Cannon House Office Bldg.	Washington	DC	20515-1604	(202) 225-6216	(202) 225-3489
ST, HD			Hon	Vinh	Railroad Signals	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005		
RR			Bill	Wimmer	Sr. Asst. VP of Engineering Management	Union Pacific Railroad	1416 Dodge St., Room 1030	Omaha	NE	68179-1000	(402) 896-6167	(402) 271-6674
EO	LO	GTF	Ton.	Winters	Chair	Sedgwick County Commission	525 North Main St., 3rd Floor	Wichita	KS	67202	(316) 383-7411	(316) 383-8275
SPEC	ASSOC.	WMCO	Margalee	Wright	Coordinator	Neighborhood Initiative	3995 East Harry, D12	Wichita	KS	67218	(316) 685-6300	(316) 685-6335

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code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
SI			Duncan	Allen	Consultant, Rail Line Safety	De Leuw, Cather & Co.	Prudential Center	Boston	MA	02199	(617) 859-2121	(617) 859-2174
FA		PR	Michael D.	Billiel		US Dept. of Justice	325 Seventh St., N.W., Ste. 500	Washington	DC	20530		
LA			Jack	Brown	Environmental Health Director	Wichita & Sedgwick Co. Dept of Community Health	1900 East 9th St.	Wichita	KS	67214	(316) 268-8457	
FA			Carol	Browner	Administrator	US EPA	401 M St., SW	Washington	DC	20460		
LA			William P.	Buchanan	County Manager	Sedgwick County	525 North Main St.	Wichita	KS	67203	(316) 383-7575	
LA			Pat	Burnett	City Clerk	City of Wichita	455 N. Main St., 12th Floor	Wichita	KS	67202	(316) 268-4529	
LA			Sharon	Carlson		Unified School District #259	1622 W. 37th Ct. N.	Wichita	KS	67204	(316) 833-2160	
SI			David	Coate	Consultant, Noise	Acentech, Inc.	33 Moulton St.	Cambridge	MA	02138	(617) 499-8019	(617) 499-8074
EO	KH		George R.	Dean	State Representative	KS House of Representatives	2646 Exchange	Wichita	KS	67217	(316) 267-6009	
EO	KH		Leslie P.	Donovan, Sr.	State Representative	KS House of Representatives	314 N. Rainbow Lake	Wichita	KS	67235	(316) 722-2923	
EO	KSEN		Christine	Downey	State Senator	Kansas Senate	300 SW 10th Ave., Room 126-S	Topeka	KS	66612-1504	(913) 296-7377	
LA			Fred	Ervin	Public Information Officer	Sedgwick County	525 N. Main Street, Room 315	Wichita	KS	67203		
EO	KH		Mike	Farmer	State Representative	KS House of Representatives	1033 Blackwell	Wichita	KS	67207	(316) 682-0364	
FA			William	Fasauher	Chief Counsel	Federal Railroad Administration	400 7th Street, SW	Washington	DC	20590		
EO	KSEN		Paul	Feleciano, Jr.	State Senator	Kansas Senate	300 SW 10th Ave., Room 452-E	Topeka	KS	66612-1504	(913) 296-7355	
EO	KH		Geraldine	Flaharty	State Representative	KS House of Representatives	1816 Fernwood	Wichita	KS	67216	(316) 524-8039	
FA		PR	Roger W.	Fones		US Dept. of Justice	555 4th St., N.W.	Washington	DC	20001		
SA		PR	David G.	Freise	PE	KS Department of Health & Environment	Forbes Field, Bldg. 283	Topeka	KS	66620-0001	(913) 296-5557	
LA			Lawrence	Garcia	Fire Chief	Wichita Fire Department	455 North Main St.	Wichita	KS	67202	(316) 268-4451	
EO	KH		Ruby	Gilbert	State Representative	KS House of Representatives	2629 N. Erie	Wichita	KS	67219	(316) 686-6585	
			William	Gill		U.S. Fish and Wildlife Service	315 Houston St.	Manhattan	KS	66502		
EO	KSEN		V.L. "Rip"	Gooch	State Senator	Kansas Senate	300 SW 10th Ave., Room 404-N	Topeka	KS	66612-1504	(913) 296-7387	
FA		PR	James N.	Habiger		Natural Resources Conservation Service	760 S. Broadway	Salina	KS	67401		
SA		PR	Ron	Hammerschmi	Director	KS Department of Health & Environment	Forbes Field, Bldg. 740	Topeka	KS	66620	(913) 296-1535	
EO	KSEN		Michael T.	Harris	State Senator	Kansas Senate	300 SW 10th Ave., Room 136-N	Topeka	KS	66612-1504	(913) 296-7385	

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LA			Irene	Hart	Director	Sedgwick Co. Bureau of Community Devel.	510 North Main St., Room 602	Wichita	KS	67203	(316) 383-8041	
EO	KH		Henry	Helgerson, Jr.	State Representative	KS House of Representatives	4009 Hammond	Wichita	KS	67218	(316) 683-7628	
LA			Joe	Hoover		Unified School District #259	3850 N. Hydraulic	Wichita	KS	67219	(316) 833-2239	
LIB			Phil	Howze	Head of Reference	Wichita State University Library	1845 Fairmount	Wichita	KS	67260-0068	(316) 978-3584	
FA			Joan S.	Huggler		US Dept. of Justice	555 4th St., N.W., Rm. 9104	Washington	DC	20001		
EO	KH		Doug	Johnston	State Representative	KS House of Representatives	333 E. English, Suite 365	Wichita	KS	67202	(316) 262-7534	
EO	KH		Tom	Klein	State Representative	KS House of Representatives	707 N. Waco	Wichita	KS	67203	(316) 265-6115	
FA		PR	Kynn	Kring	Environmental Review Coordinator	EPA Region 7	726 Minnesota Ave.	Kansas City	KS	66101		
LA			Marvin	Krout	Planning Director	Wichita & Sedgwick Co. Metropolitan Area Planning Dept.	455 North Main St., 10th Floor	Wichita	KS	67202	(316) 268-4421	(31[illegible]) 268-4390
LA			Steve	Lackey	Director	Wichita Public Works Department	455 North Main St.	Wichita	KS	67202	(316) 268-4422	
EO	KH		Brenda K.	Landwehr	State Representative	KS House of Representatives	1927 N. Gow	Wichita	KS	67204	(316) 945-0026	
EO	KSEN		Barbara	Lawrence	State Senator	Kansas Senate	300 SW 10th Ave., Room 143-N	Topeka	KS	66612-1504	(913) 296-7386	
RR		PR	Michael A.	Listgarten		Covington & Burling	1201 Pennsylvania Ave., N.W.	Washington	DC	20044-7566		
ST			Dan	Luscher	Consultant, Air Quality	Acurex Environmental	555 Clyde Ave.	Mountain	CA	94043	(415) 254-2416	(415) 254-2496
LA		GTF	Stephen	Mangan	Chairman	Governor's Agriculture Advisory Board	PO Box 631	Tribune	KS	67879	(316) 376-2166	
EO	KH		Carlos	Mayans	State Representative	KS House of Representatives	1842 N. Valleyview	Wichita	KS	67212	(316) 722-0286	
LA		PR	David	McComb		Zoning and Utilities	206 W. First Ave.	Hutchinson	KS	67501		
			Bob	McDowell		Corps of Engineers	700 Federal Building	Kansas City	M	64108-2896		
FA		PR	Robert L.	McGeorge		US Dept. of Justice	555 4th St., N.W., Rm. 9104	Washington	D.	20001		
FA		PR	Ravena L.	Michael		US EPA	726 Minnesota Ave.	Kansas City	KS	68404		
EO	USC		Jerry	Moran	US Representative	US House of Representatives	1217 Longworth House Office Bldg.	Washington	DC	20515	(202) 225-2715	(202) 225-5124
LA			Michael	Morland	Chief of Police	Kechi City Offices	200 W. Kechi Rd.	Kechi	KS	67067	(316) 744-9287	
EO	KH		Don	Myers	State Representative	KS House of Representatives	613 Briarwood	Derby	KS	67037	(316) 788-0014	
EO	KH		Peggy	Palmer	State Representative	KS House of Representatives	5 Flanigan Drive	Augusta	KS	67010	(316) 686-7281	
EO	KSEN	GTF	Lillian	Papay	State Senator	KS Senate	1416 Coolidge	Great Bend	KS	67530	(316) 793-6870	

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LA			Stephen	Plummer	County Counsel	Sedgwick County	525 North Main St., 13th Floor	Wichita	KS	67203-3790	(316) 383-7111	
LA			Thomas	Pollar	Director	Sedgwick Co. Emergency Medical Services	538 North Main St.	Wichita	KS	67203	(316) 383-7239	
GI		PR	Alan R.	Post	Attorney		1803 North Siefkin St.	Wichita	KS	67203	(316) 686-8232	
EO	KH		Jo Ann	Pottorff	State Representative	KS House of Representatives	144 N. Oliver	Wichita	KS	67208	(316) 682-5581	
EO	KH		Anthony J.	Powell	State Representative	KS House of Representatives	500 N. Market St.	Wichita	KS	67214	(316) 263-3200	
EO	KH		Ted	Powers	State Representative	KS House of Representatives	1492 N. Powers Dr.	Mulvane	KS	67110	(316) 777-4310	
SA		PR	Ramon	Powers		Kansas Historic District	6425 S.W. 6th St.	Topeka	KS	66612		
LIB			Richard	Rademacher	Director	Wichita and Sedgwick County Library	223 South Main St.	Wichita	KS	67202	(316) 262-0611	(316) 262-4540
EO	KSEN		Pat	Ranson	State Senator	Kansas Senate	300 SW 10th Ave., Room 143-N	Topeka	KS	66612-1504	(913) 296-7391	
FA			Jamie	Rappaport-Cl	Asst. Director	US Fish & Wildlife Service	1849 C St., NW, Room 3242	Washington	DC	20240		
LA			Ed	Raymond		Unified School District #259	3850 N. Hydraulic	Wichita	KS	67219	(316) 833-2179	
LA		PR	Gary	Rebenstorf	Director of Law	City of Wichita	455 North Main St., 13th Floor	Wichita	KS	67203	(316) 268-4681	(316) 268-4519
RR		PR	Arvid E.	Roach, II		Covington & Burling	1201 Pennsylvania Ave., N.W.	Washington	DC	20044-7566		
RR		PR	Michael L.	Rosenthal		Covington & Burling	1201 Pennsylvania Ave., N.W.	Washington	DC	20044-7566		
EO	KH		Tom	Sawyer	State Representative	KS House of Representatives	1041 S. Elizabeth St.	Wichita	KS	67213	(316) 265-7096	
ST			Bob	Schaevitz	Consultant, Financing and Funding	Decision Economics, Inc.	2233 watt Ave.	Sacrament	CA	95825	(916) 486-8042	(916) 486-8043
SA			John	Scheirman	Bureau Chief	Kansas Department of Transportation	Docking State Office Building	Topeka	KS	66612	(913) 296-4286	(913) 296-2274
EO	USC		Matt	Schlapp		Office of Representative Tiahrt	428 Cannon House Office Building	Washington	DC	20515	(202) 225-6216	(202) 225-3489
SPEC	BE	PR	Susan	Settsam		Kansas Corporate Commission	1500 Arrowhead Road	Topeka	KS	66604	(913) 271-3100	
EO	KH		Tim	Shallenburger	State Representative	KS House of Representatives	2027 Fairview	Baxter	KS	66713	(316) 856-3461	
SA			Jan	Sides	Chief of Technical Services Division	KS Dept. of Health & Environment, Bureau of Air & Radiation	Forbes Field, Bldg. 283	Topeka	KS	66620	(913) 296-1551	(913) 296-1545
FA			Rodney	Slater	Secretary	US Dept. of Transportation	400 7th St., SW, Room 10200	Washington	DC	20490		
FA		PR	Paul Samuel	Smith		US Dept. of Transportation	400 7th St., S.W., Rm. 4102 C-30	Washington	DC	20590		
EO	USC		Vince	Snowbarger	US Representative	US House of Representatives	509 Cannon House Office Bldg.	Washington	DC	20515	(202) 225-2865	(202) 225-3897
LA			Becky	Stewart	Director	Sedgwick Co. Dept. of Emergency	525 North Main St.	Wichita	KS	67203	(316) 383-7077	

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SI			Ed	Stolloff	Traffic and Pedestrian Safety	De Leuw, Cather & Co.	1133 15th Street NW, Suite 800	Washington	DC	20005	(202) 775-3380	(312) 930-0018
EO	KH		Dale	Swenson	State Representative	KS House of Representatives	3145 Fern	Wichita	KS	67217	(316) 524-3976	
IA			Mike	Taylor	Intergovernmental Relations Director	City of Wichita	455 North Main St., 13th Floor	Wichita	KS	67202	(316) 268-4351	(316) 268-4519
EO	KH		Daniel J.	Thimesch	State Representative	KS House of Representatives	30121 W. 63rd South	Cheney	KS	67025	(316) 531-2995	
FA			Larry	Toerber		Federal Railroad Administration	401 N. Market St.	Wichita	KS	67202	(316) 283-1088	
EO	KSEN		Ben	Vidricksen	Chairperson	Kansas Senate Transportation & Utilities Comm.	1427 West Republic	Salina	KS	67401	(913) 827-9546	
EO	KH		Billie	Vining	State Representative	KS House of Representatives	3849 North Clarence	Wichita	KS	67204	(316) 832-0346	
EO	KH		Susan	Wagle	State Representative	KS House of Representatives	14 N. Sandalwood	Wichita	KS	67230	(316) 733-5698	
FA		LBL	Jim	Warnack		Federal Railroad Administration	3600 W. Kelloge	Wichita	KS	67213	(316) 946-5538	
EO	KH		Jonathan	Wells	State Representative	KS House of Representatives	P.O. Box 2543	Wichita	KS	67201	(316) 267-4083	
EO	KH		Gwen	Welshimer	State Representative	KS House of Representatives	6103 Castle	Wichita	KS	67218	(316) 685-1930	

Parties Who Received PMP by Certified Return Receipt Mail - Wichita **September 15, 1997**

code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
SPEC	NA	PR	Leon	Campbell	Chairperson	Iowa Tribe of Kansas & Nebraska	Rt. 1, Box 58A	White	KS	66094		
FA, SPEC	NA	PR	Bill	Collier		Bureau of Indian Affairs	101 N. 5th St.	Muskogee	OK	74401		
FA	NA		Ada	Deer	Asst. Secretary	Bureau of Indian Affairs	1849 C St., NW	Washington	DC	20240		
FA, SPEC	NA	PR	James	DeHaas	Superintendent	Anadarko Agency	P.O. Box 309	Anadarko	OK	73005		
			Robert	Jones	Superintendent	Shawnee Agency	624 W. Independence, Ste. 114	Shawnee	OK	74801		
SPEC, FA	NA	PR	Julia	Langan	Superintendent	Pawnee Agency	P.O. Box 440	Pawnee	OK	74058		
SPEC	NA	PR	Marnie	Rupnicki	Chairperson	Prairie Band Potawatomi of KS	14880 K. Road	Mayetta	KS	66509		
SPEC	NA	PR	Corbin	Shuckahosee	Chairman	Sac and Fox of Missouri	Rt. 1, Box 60	Reserve	KS	66434		
SPEC	NA	PR	Fred	Thomas	Chairman	Kickapoo of Kansas	P.O. Box 271	Horton	KS	66439		
FA, SPEC	NA	PR	Steve	York	Superintendent	Horton Agency	P.O. Box 31	Horton	KS	66439		

Parties Who Received Notice of Meeting and Availability of PMP - Wichita **September 15, 1997**

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MED	NP					Haysville Times	547 East Grand	Haysville	KS	67060	(316) 524-6868	
MED	RAD					KFDI - AM & FM RADIO	42 and North Broadway	Wichita	KS	67219	(316) 838-3771	
MED	TV					KAKE - TV 10	1500 North West	Wichita	KS	67203	(316) 943-4221	
MED	TV					KSNW - TV 3	833 North Main St.	Wichita	KS	67203	(316) 265-3333	
GI		LBL, LBA	Diana	Alexander			2509 Raleigh	Wichita	KS	67219	(316) 684-0866	
SPEC	ASSOC.		Kay	Alley		Northeast CPO Neighborhood Council 1	6434 Pepperwood	Wichita	KS	67226	(316) 687-0077	
SPEC	ASSOC.		Sharon	Askew		Hilltop-Jefferson Community Association	1330 Bluffview	Wichita	KS	67218	(316) 682-1575	
GI		LBL, LBA	David	Babich			4431 Ironwood	Wichita	KS	67226	(316) 634-0832	
RR			R. R.	Bagby		Central Kansas Railway	1825 West Harry	Wichita	KS	67202	(316) 263-3113	
SPEC	ASSOC.		June	Bailey		Orchard Breeze Neighborhood Association	334 N Baehr	Wichita	KS	67212	(316) 945-7876	
SPEC	ASSOC.		Kerry	Baker		South Wichita Business Association	P.O. Box 16066	Wichita	KS	67216	(316) 524-4237	
SPEC	ASSOC.		Kelly D.	Beltz		Northwest CPO Neighborhood Council 5	859 Murray	Wichita	KS	67212	(316) 721-2736	
SPEC	ASSOC.		Peggy	Bennett	Second Vice President	Southwest CPO Neighborhood Council 4	1808 Anita	Wichita	KS	67217	(316) 942-2273	
GI		LBL, LBA	Sam	Bhakea			1421 N. Broadway	Wichita	KS	67214	(316) 263-0970	
GI		LBL, LBA	Darrel	Bishop			8518 Longlake	Wichita	KS	67207	(316) 684-0988	
LIB			Martie	Bogle	Librarian	Sedgwick County Law Library	301 North Main St., Suite #700	Wichita	KS	67202	(316) 263-2251	
GI			John	Borst			401 E 3	Wichita	KS	67202	(316) 264-9860	
SPEC	ASSOC.		Carl	Brewer	President	Northeast CPO Neighborhood Council 1	4324 Norwood	Wichita	KS	67220	(316) 523-0075	
SPEC	ASSOC.		Kimberly	Brewster		East CPO Neighborhood Council 2	339 North Oakwood Dr.	Wichita	KS	67218	(316) 267-6406	
LA			Jeff	Bridges	City Administrator		P.O. Box 295	Andover	KS	67002	(316) 733-1303	
GI		LBL, LBA	David	Burk			835 E. First Street	Wichita	KS	67202	(316) 267-0505	
SPEC	ASSOC.		Sharri	Burke		New Salem Neighborhood Association	144 N. Madison	Wichita	KS	67218	(316) 262-1794	
GI		LBL, LBA	Brad & Tracy	Burns			2116 E. Central Ave.	Wichita	KS	67214	(316) 267-0596	
GI			Larry	Busch		School Services & Leasing	250 W. 53rd St. N.	Wichita	KS	67204	(316) [illegible]38-1555	
SPEC	ASSOC.		Jerry D.	Busch	Second Vice President	North Central CPO	1574 North Charles	Wichita	KS	67203	(316) 943-6501	

Parties Who Received Notice of Meeting and Availability of PMP - Wichita **September 15, 1997**

code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
SPEC	ASSOC.		Larry D.	Bush	First Vice President	Southwest CPO Neighborhood Council 4	907 East Mona Circle	Wichita	KS	67216	(316) 689-4702	
SPEC	ASSOC.		Barry L.	Carroll	Administrative Assistant	CPO Coordinating Board	455 North Main St., 13th Floor	Wichita	KS	67202	(316) 268-4516	
			Veronica	Casados	Principal	Irving School	1642 N. Market	Wichita	KS	67214	(316) 833-3065	
SPEC	ASSOC.		Paul H.	Clark		Northwest CPO Neighborhood Council 5	1374 Peterson	Wichita	KS	67212	(316) 722-6434	
SPEC	ASSOC.		Daniel S.	Clark		North Central CPO	1308 Wellington Place	Wichita	KS	67203	(316) 943-6501	
LA			Stephen	Cole		City of Wichita	455 North Main St.	Wichita	KS	67202	(316) 337-9200	
SPEC	BE		George	Connoly		Wichita Chamber of Commerce	1429 Perry	Wichita	KS	67203	(316) 264-6610	
MED	NP		Margaret	Courtney		Wichita Eagle	825 East Douglas St.	Wichita	KS	67202	(316) 268-6333	(316) 268-6658
SPEC	ASSOC.		Susan	Crawshaw		Ken-Mar Neighborhood Association	1715 N.E. Parkway	Wichita	KS	67208	(316) 686-1678	
GI		LBL	Willie	Crocklin		Dunbar Theatre	1007 N. Cleveland	Wichita	KS		(316) 685-4486	
SPEC	ASSOC.		Fran	Crowley		Chisolm Creek Neighborhood Association					(316) 832-7625	
LA			Gary	Curmode	Fire Chief	Sedgwick County Fire District #1	Fire Station #37, 4343 North Woodlawn	Wichita	KS	67220	(316) 744-0471	
RR			Mark	Davis	Regional Director, Public Relations	Union Pacific Railroad	1416 Dodge St., Rm. #605	Omaha	NE	68179	(402) 271-5459	(402) 271-5572
SPEC	ASSOC.		Steve	Davis	First Vice President	Northeast CPO Neighborhood Council 1	2505 East Douglas, #10	Wichita	KS	67211	(316) 523-1128	
SPEC	ASSOC.		Paul E.	Davis		Southeast CPO Neighborhood Council 3	2107 South Waco	Wichita	KS	67213	(316) 524-8644	
SPEC	ASSOC.		Wayne	Dean		Southwest Neighborhood Association					(316) 942-7795	
GI		LBL, LBA	John	Deck			3625 E. 9th St.	Wichita	KS	67204	(316) 684-8208	
SPEC	ASSOC.		Millie	Denholm		Benjamin Hills Neighborhood Association					(316) 838-6258	
SPEC	ASSOC.		Judith	Dillard		Southeast CPO Neighborhood Council 3	4560 South Hydraulic, Lot 414	Wichita	KS	67216	(316) 978-3015	
GI			Robert	Dixon	CEO	Riverside Health Systems	2622 West Central	Wichita	KS	67203	(316) 946-5000	
SPEC	ASSOC.		Delora	Donovan		North Riverside Neighborhood Association	1559 Ferrell Dr.	Wichita	KS	67203	(316) 262-0596	
SPEC	ASSOC.		Ellen	Dreher		Fairmount Neighborhood Association					(316) 684-8016	
SPEC	ASSOC.		Larry	Easley		North Central CPO Neighborhood Council 6	527 South Osage	Wichita	KS	67213	(316) 265-4722	
GI		LBL, LBA	Donald E.	Eber			141 N. Spruce	Wichita	KS	67214	(316) 264-8118	
LA			Rick	Eberhard		City of Kechi	P.O. Box 326	Kechi	KS	67067	(316) 744-1337	

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SPEC	BE		Ann	Edwards	President	Wichita Association of Realtors	540 South Broadway	Wichita	KS	67212	(316) 263-3167	
RR			R. L.	Engle	Assistant Vice President - Construction	BN/Santa Fe	4515 Kansas Ave.	Kansas City	KS	66106	(913) 551-4061	(913) 551-4077
GI			David	Estrada		XPORTS Co.	1518 S. Ellis	Wichita	KS	67211	(316) 267-7287	
LA			Rich	Euson	County Counsel	Sedgwick County	525 North Main St., 13th Floor	Wichita	KS	67203-3790	(316) 383-7111	
GI		LBL, LBA	James W.	Feiring			7520 East 21st Street, #1	Wichita	KS	67206	(316) 682-0051	
SPEC	HI		Jim	Fenton		Historic Midtown Citizens Assoc.	1208 N. Emporia	Wichita	KS	67214	(316) 265-5017	
SPEC	ASSOC.		Bill N.	Fox		North Central CPO Neighborhood Council 6	703 Litchfield	Wichita	KS	67203	(316) 383-7798	
LA			John	Frye		MAPC	1143 Patricia	Wichita	KS	67208	(316) 685-9514	
SPEC	ASSOC.		Barb Travis	Fuller	Second Vice President	East CPO Neighborhood Council 2	6900 East Zimmerly	Wichita	KS	67207	(316) 833-4889	
LA			Diane	Gage		Sedgwick County	525 North Main St., Suite B-6	Wichita	KS	67203	(316) 383-7077	
SPEC	BE		Wes	Galyon		Wichita Area Builders Assoc.	730 North Main	Wichita	KS	67203	(316) 265-4226	
GI		LBL, LBA	Sharon	Gaugler			1002 S. Broadway	Wichita	KS	67211	(316) 263-5344	
SPEC	ASSOC.		Virdena	Gilkey	Neighborhood Assistant	CPO Coordinating Board	455 North Main St., 13th Floor	Wichita	KS	67202	(316) 268-4516	
GI		LBL, LBA	George	Gird			1821 S. Wichita	Wichita	KS	67213	(316) 263-6391	
GI			George	Glover		Reach, Inc.	1333 N. Broadway	Wichita	KS	67214	(316) 269-1333	
SPEC	ASSOC.		C. George	Glover		East CPO Neighborhood Council 2	2625 South Linden Court	Wichita	KS	67210	(316) 265-8511	
RR			Thomas	Greenland	Environmental Counsel	Union Pacific Railroad	1416 Dodge St.	Omaha	NE	68179	(402) 271-4364	(402) 271-5610
SPEC	ASSOC.		Reverend	Hadley		South Central Improvement Alliance					(316) 262-6195	
SPEC	ASSOC.		Trina	Heath	Second Vice President	Northeast CPO Neighborhood Council 1	341 North Spruce	Wichita	KS	67214	(316) 264-0343	
LA			James	Heinicke	Acting City Manager	City of Newton	P.O. Box 426	Newton	KS	67114	(316) 284-6001	
SPEC	ASSOC.		Tony	Hemmen		Northwest CPO Neighborhood Council 5	1728 North Mt. Carmel	Wichita	KS	67203	(316) 676-8342	
GI			Ray	Hinderliter	President	Power Chemicals, Inc.	4502 S. Broadway	Wichita	KS	67216	(316) 524-7899	(316) 524-9279
SPEC	ASSOC.		Ben T.	Huie		Northwest CPO Neighborhood Council 5	12011 Rolling Hills	Wichita	KS	67235-1303	(316) 721-5972	
GI		LBL, LBA	John	Hull			154 N. Broadway	Wichita	KS	67202	(316) 268-2365	
SPEC	ASSOC.		Elena	Ingle	President	Southeast CPO Neighborhood Council 3	3608 Meadow Lane	Wichita	KS	67218	(316) 264-3001	

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GI			James	Irlandi		Skill Transportation	1809 West Broadway, Suite F	Wichita	KS	67214	(316) 684-1960	
SPEC	BE		Pat	James		Wichita Area Chamber of Commerce	350 W. Douglas	Wichita	KS	67202	(316) 268-1157	(316) 265-7502
GI		LBL, LBA	Bill	Jarrell			P.O. Box 7730 K12-10	Wichita	KS	67277	(316) 523-1297	
SPEC	ASSOC.		Belyndae S.	Johanningsm	Second Vice President	Southeast CPO Neighborhood Council 3	4309 East Lincoln	Wichita	KS	67218	(316) 685-5830	
GI		LBL, LBA	Joe	Johnson			220 S. Hillside	Wichita	KS	67211	(316) 684-0171	
SPEC	ASSOC.		Carol R.	June		North Central CPO Neighborhood Council 6	2003 North Jackson	Wichita	KS	67203	(316) 262-7090	
SPEC	ASSOC.		Twyla D.	Keffeler		North Central CPO Neighborhood Council 6	1755 North Porter	Wichita	KS	67203	(316) 942-2212	
SPEC	ASSOC.		John J.	Kimmel	First Vice President	East CPO Neighborhood Council 2	714 North Brookfield	Wichita	KS	67206	(316) 265-7984	
SPEC	ASSOC.		Kevin	Kimmel		Partners for Responsible Neighborhoods					(316) 265-7977	
SPEC	ASSOC.		Beth	King	President	East CPO Neighborhood Council 2	4222 East English	Wichita	KS	67218	(316) 267-9235	
LO			Jane	Knight		Office of the Governor	130 South Market, #1020	Wichita	KS	67202	(316) 337-7372	
SPEC	ASSOC.		Edwin E.	Koon		Southwest CPO Neighborhood Council 4	236 South Nevada	Wichita	KS	67209	(316) 676-7543	
RR			Robert	Krebs	President and CEO	BN/Santa Fe	2650 Lou Menk Drive	Fort Worth	TX	76131	(817) 352-6400	
RR			J. Allen	Kuhn	Manager - Public Projects	BN/Santa Fe	3253 East Chestnut Expressway	Springfield	M	65802	(417) 864-2167	(417) 864-2168
SPEC	ASSOC.		Cathy	Landwehr	First Vice President	North Central CPO Neighborhood Council 6	1525 North Waco	Wichita	KS	67203	(316) 685-6300	
GI			John A.	Laughary Jr.			2444 Hyacinth	Wichita	KS	67204	(316) 832-0053	
MED	RAD		George	Lawson		KFDI	4200 N. Old Lawrence Rd.	Wichita	KS	67201	(316) 838-3771	
SPEC	BE	GTF	Bill	Lebert	President	First Kansas Bank	101 North Main St.	Hoisington	KS	65744	(316) 653-4921	
SPEC	ASSOC.		Fran	Lewis		Southwest CPO Neighborhood Council 4	1639 South Fern	Wichita	KS	67213	(316) 264-2229	
SPEC	ASSOC.	NT	Paul L.	Light			865 S. Millwood	Wichita	KS	67219	(316) 267-9110	
GI		LBL, LBA	Conner	Lindsey			1002 S. Broadway	Wichita	KS	67211	(316) 263-5344	
GI			Bill	Livingston	Architect	Gossen Livingston Architects	420 S. Emporia	Wichita	KS	67202	(316) 265-9367	
SPEC	ASSOC.		Jaime	Lopez or Rita		Hispanic/Native American Coalition	3995 E. Harry	Wichita	KS	67218	(316) 685-6300	
GI		LBL, LBA	Sarah	Lunday			825 E. Douglas	Wichita	KS	67203	(316) 268-6404	
SPEC	ASSOC.		Merle	Manlove		North Central CPO Neighborhood Council 6	715 West Ninth St.	Wichita	KS	67203	(316) 264-4238	

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SPEC	ASSOC.		Janet	Marden		East CPO Neighborhood Council 2	9472 East Mt. Vernon Court	Wichita	KS	67207	(316) 688-2304	
SPEC	ASSOC.		Dennis	Martin		Northeast CPO Neighborhood Council 1	1447 North Piatt	Wichita	KS	67214	(316) 526-5082	
SPEC	ASSOC.		Linda	Matney		La Placita Park Neighborhood Association	3576 Ponderosa	Wichita	KS	67208	(316) 942-0001	
GI			James	McClellan			1752 S. Wichita	Wichita	KS	67213	(316) 265-8903	
SPEC	ASSOC.		Robert	McCune		Southeast CPO Neighborhood Council 3	3500 Craig	Wichita	KS	67216	(316) 685-6364	
RR			James	Merritt	President	Central Kansas Railway	1825 West Harry	Wichita	KS	67213	(316) 263-3113	(316) 263-5563
SPEC	ASSOC.		Janet	Miller		Historic Midtown Citizens Association	P.O. Box 47302	Wichita	KS	67201	(316) 264-2988	
SPEC	ASSOC.		Thurman	Mitchell		Northeast CPO Neighborhood Council 1	1842 North Hydraulic	Wichita	KS	67214-1641	(316) 838-1555	
SPEC	ASSOC.		Debby	Moore		Northeast CPO Neighborhood Council 1	2742 East Second Street	Wichita	KS	67214-4605	(316) 681-1743	
SPEC	ASSOC.		Jeanette	Moore		Delano Neighborhood Association	623 S. Glenn	Wichita	KS	67213	(316) 262-6215	
GI		LBL, LBA	Bob	Moser			335 N. Mission Rd.	Wichita	KS	67206	(316) 683-2853	
SPEC	ASSOC.		Dorothy	Nave		N. E. Millair Neighborhood Assoc.	1802 Looman	Wichita	KS	67219	(316) 262-7667	
RR			Marvin	Nelson	Director of Public Projects	BN/Santa Fe	4515 Kansas Ave.	Kansas City	KS	66106	(913) 551-4024	
SPEC	ASSOC.		Ora L.	Nestelroad		Southeast CPO Neighborhood Council 3	1939 South Parkwood Lane	Wichita	KS	67208	(316) 683-4456	
SPEC	ASSOC.		Lois Ann	Newman		South Central Progressive Association	2112 S. Topeka	Wichita	KS	67211-4833	(316) 264-3557	
SPEC	ASSOC.		Alvin	Nixon		N. E. Millair Neighborhood Assoc.	1739 Looman	Wichita	KS	67219	(316) 262-3034	
RR			Mike	Ogborn	Managing Director	OmniTRAX, Inc.	252 Clayton Street, 4th Floor	Denver	CO	80206	(303) 393-0033	(303) 393-0041
GI	LBL		John	Oswald		Wilson & Co. Engineers & Architects	3059 W. 13th Street	Wichita	KS	67203	(316) 946-9800	
SPEC	ASSOC.		Diane Z.	Park		East CPO Neighborhood Council 2	241 North Armour	Wichita	KS	67206	(316) 686-7121	
SPEC	ASSOC.		Judy S.	Park	Second Vice President	Northwest CPO Neighborhood Council 5	12231 West Sheriac Circle	Wichita	KS	67235-1400	(316) 721-9393	
GI		LBL, LBA	Jayesh	Patel			2834 N. Market	Wichita	KS	67219	(316) 838-2161	
RR			R.E.	Pearce	Manager	Atchison, Topeka and Santa Fe Railway Co.	4515 Kansas Ave.	Kansas City	KS	66106	(913) 551-4418	(913) 822-4797
SPEC	ASSOC.		John	Polson		Northeast CPO Neighborhood Council 1	621 North Fountain	Wichita	KS	67208	(316) 267-8411	
LA			Carlota	Ponds		Sedgwick County	455 North Main St., Suite 843	Wichita	KS	67203	(316) 383-7575	
GI			Tony	Rangel		Gossen Livingston Architects	420 S. Emporia	Wichita	KS	67202	(316) 265-9367	

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GI			Leroy	Rheault	President & CEO	Via Christi Health System	929 North St. Francis	Wichita	KS	67214	(316) 268-5102	
SPEC	ASSOC.		Linda	Richards		Southwest CPO Neighborhood Council 4	3122 South St. Paul	Wichita	KS	67217	(316) 942-7713	
GI			Dean	Riggs			624 E. 1st	Wichita	KS	67202	(316) 264-0699	
SPEC	ASSOC.		Viola	Riley		Country Overlook Neighborhood Association	953 N. Crestway	Wichita	KS	67208	(316) 687-5621	
SPEC	ASSOC.		Emalyn	Rogers		Northeast CPO Neighborhood Council 1	2527 North Roosevelt Court	Wichita	KS	67220-2856	(316) 685-5065	
SPEC	ASSOC.		Bill	Rogers		Jones Park Neighborhood Association	3245 Jackson	Wichita	KS	67204	(316) 838-1825	
GI		LBL, LBA	Joseph D.	Rose			2102 S. Waco	Wichita	KS	67213	(316) 264-5498	
SPEC	ASSOC.		Larry	Ross		East CPO Neighborhood Council 2	PO Box 2585	Wichita	KS	67201-2585	(316) 682-0988	
SPEC	ASSOC.		Ronald F.	Ross		Southwest CPO Neighborhood Council 4	4702 Euclid	Wichita	KS	67217	(316) 943-1266	
SPEC	ASSOC.		David	Ross		Indian Hills Neighborhood Association	1317 Tahoe Trail	Wichita	KS	67203	(316) 945-0427	
LA		GTF	Eric	Rucker	County Attorney	Dickinson County Attorney's Office	403 West 7th	Woodbine	KS	67492	(913) 263-2646	
LA			Mike	Rudd		Wichita Fire Department	455 North Main St.	Wichita	KS	67202	(316) 268-4565	
GI			Eugene	Russell	Professor of Civil Engineering	Kansas State University	Durland Hall	Manhattan	KS	66505	(913) 532-5862	
SPEC	ASSOC.		Donald	Scaia		Southwest CPO Neighborhood Council 4	302 North Edwards	Wichita	KS	67203	(316) 943-1250	
GI		LBL, LBA	George	Schiller			2101 S. Elizabeth, #602	Wichita	KS	67213	(316) 264-2253	
SPEC	ASSOC.		Tom	Schneider	Administrative Assistant	CPO Coordinating Board	455 North Main St., 13th Floor	Wichita	KS	67202	(316) 268-4516	
MED	NP		Janet	Shadden		Wichita Eagle	825 East Douglas St.	Wichita	KS	67201	(316) 268-6504	(316) 268-6627
GI			Dwayne	Shannon	Chief Executive Officer	Metal-Fab, Inc.	PO Box 1138	Wichita	KS	67201-1138	(316) 943-2351	(316) 943-2717
SPEC	ASSOC.		Fred	Sharshel		South City Community Association	3457 S. Ida	Wichita	KS	67216	(316) 529-3029	
SPEC	ASSOC.		Dorothy	Shelby		Millair Neighborhood Assoc.	2560 N. Minneapolis	Wichita	KS	67219	(316) 263-2987	
SPEC	ASSOC.		Steve	Shoemaker		Northwest Big River Neighborhood Association	1618 N McComas	Wichita	KS	67203	(316) 946-9870	
SPEC	ASSOC.		Frank	Shofler		Partners for Responsible Neighborhoods					(316) 264-0069	
GI		LBL, LBA	Ken	Short			6917 Stonegate	Wichita	KS	67206	(316) 687-4206	
SPEC	ASSOC.		Debbie	Sisco		Oakview Neighborhood Association					(316) 529-2040	
SPEC	ASSOC.		Dorathea	Sloan	President	North Central CPO Neighborhood Council 6	3929 North Athenian	Wichita	KS	67204	(316) 721-9271	

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GI		LBL, LBA	Albert	Smith			501 Olive	Peabody	KS	66866	(316) 983-2475	
RR			Michael A.	Smith	General Attorney	Atchison, Topeka and Santa Fe Railway Co.	1700 East Golf Rd., 6th Floor	Schaumbur	IL	60173	(708) 995-6880	(708) 996-6846
SPEC	ASSOC.		Dewey	Smith		Meadowlark Neighborhood Association	2244 S. Pershing	Wichita	KS	67218	(316) 686-0461	
SPEC	BE		Roland	Smith	Director	Independent Business Association	2604 West 9th	Wichita	KS	67203	(316) 943-2565	
SPEC	ASSOC.		Al	Soiis		Northwest CPO Neighborhood Council 5	849 Country Acres	Wichita	KS	67212	(316) 722-3055	
GI			Candi	Spacil	Principal	Park School	1025 N. Main	Wichita	KS	67214	(316) 833-3090	
GI		nt	Lloyd	Stagner			1402 W. 5th Street	Newton	KS	67114	(316) 283-6449	
LA			Stewart	Stan	City Manager	City of El Dorado	P.O. Box 792	El Dorado	KS	67042	(316) 321-9100	
GI			John	Stanek		JLS Enterprises	Route 1, Box 47A	Mt. Calvary	WI	53057	(414) 753-3308	
GI		LBL, LBA	J. R.	Stang			300 E. 8th Street	Sedgwick	KS	67135	(316)772-0350	
LA			John	Stark	Supervisor of Air Quality	Wichita & Sedgwick Co. Dept. of Community Health	1900 East 9th St.	Wichita	KS	67214	(316) 268-8449	
GI		GTF	Junior	Strecker	General Manager	Scott Cooperative	602 Jackson	Scott City	KS	67871	(316) 872-5823	
GI			Steve	Sturgeon			6601 College Blvd.	Overland	KS	66211	(913) 458-9187	
SPEC	ASSOC.		Roz	Taylor		Planeview United Neighborhood Association					(316) 682-0232	
GI		LBL, LBA	Maurice	Terrebonne			6610 Rodeo Ct.	Wichita	KS	67226	(316) 744-2747	
MED	NP		Rick	Thames	Editor	Wichita Eagle	825 East Douglas St.	Wichita	KS	67201	(316) 268-6333	
RR			Monty	Thomas	Superintendent	Central Kansas Railway	1825 West Harry	Wichita	KS	67213	(316) 263-3113	(316) 263-8346
SPEC	ASSOC.		Eddie	Thomas		Power Neighborhood Association	1902 East 17th St	Wichita	KS	67214	(316) 265-4048	
RR			William	Thomson, Jr.	Manager Public Projects	Atchison, Topeka and Santa Fe Railway Co.	4515 Kansas Ave.	Kansas City	KS	66106	(913) 551-4484	(913) 551-2733
GI		LBL, LBA	Dennis	Todd			301 S. Summit	El Dorado	KS	67042	(316) 321-6615	
RR			Ed	Trandahl		Union Pacific Rail Road	1416 Dodge St.	Omaha	NB	68179	(402) 271-3165	
GI		LBL, LBA	Tim	Trans			P.O. Box 85	Wichita	KS	67201	(316) 676-7689	
GI		LBL, LBA	Patricia	Valadez			12509 W. Hardtner Ct.	Wichita	KS	67235	(316) 721-4735	
GI		LBL	Jeff	Van Sickle		MVP Corp.	P.O. Box 3848	Wichita	KS	67201	(316) 262-0451	
LA			William	Watson	Chief of Police	Wichita Police Department	455 North Main St.	Wichita	KS	67202	(316) 268-4158	

Parties Who Received Notice of Meeting and Availability of PMP - Wichita **September 15, 1997**

code 1	2	3	first name	last name	title	organization	street	city	state	zip	phone	fax
SPEC	HI		Ken	Watson		Historic Midtown Citizens Assoc.	1208 N. Emporia	Wichita	KS	67214	(316) 265-5017	
RR			Richard E.	Weicher	VP - Law and General Counsel	BN/Santa Fe	1700 East Golf Rd.	Schaumbur	IL	60173	(847) 995-6887	(847) 995-6540
GI		LBL, LBA	Mark E. and	Weiser			4148 S. Hydraulic #10	Wichita	KS	67216	(316) 522-8679	
SPEC	ASSOC.		Connie	Wells		North Central Neighborhood Association	1802 E 13th St	Wichita	KS	67214	(316) 262-2463	
GI		LBL, LBA	Jon	Westerman			3101 Broadway, Suite 900	Kansas City	M	64111	(816) 561-9054	
SPEC	ASSOC.		Sandra	Whittington	First Vice President	Northwest CPO Neighborhood Council 5	1931 North Mt. Carmel	Wichita	KS	67203	(316) 833-3680	
SPEC	ASSOC.		Shirley	Wilhite		Southeast CPO Neighborhood Council 3	2997 South Clifton	Wichita	KS	67210	(316) 685-1970	
LA			Norman	Williams		City of Wichita	455 North Main St.	Wichita	KS	67202	(316) 268-4239	
GI			Mychael	Willon	Director, HIP Complex		1243 N. Market	Wichita	KS	67214	(316) 833-3125	
SPEC	ASSOC.		Joe	Wilson		Northwest CPO Neighborhood Council 5	1652 Westlynn	Wichita	KS	67212	(316) 676-8269	
GI		LBL, LBA	Skeets	Winkler			115 S. Rutan	Wichita	KS	67218	(316) 684-4366	
SPEC	ASSOC.		Pat	Winters		Eastridge Neighborhood Association	746 Governor St.	Wichita	KS	67207	(316) 687-6226	
SPEC	BE		F. Tim	Witsman	President	Wichita Area Chamber of Commerce	350 West Douglas	Wichita	KS	67202	(316) 265-7771	(316) 265-7502
GI		LBL, LBA	Ken & Norma	Wood			1525 Glenhurst	Wichita	KS	67212	(316) 722-0864	
SPEC	ASSOC.		Bill	Woolley		East CPO Neighborhood Council 2	8309 Brookhollow	Wichita	KS	67206	(316) 687-2400	
GI		LBL, LBA	Marge	Zakoura-Vaug			1033 Eastern	Wichita	KS	67207	(316) 684-3256	
MED	NP		Mark	Zieman		Kansas City Star	1729 Grand Blvd.	Kansas City	KS	64108	(816) 234-4141	(816) 234-4926